

# Prophylactic Subclavian Artery Revascularization is Protective Against Lower Extremity Neurologic Deficits with TEVAR

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# DISCLOSURE

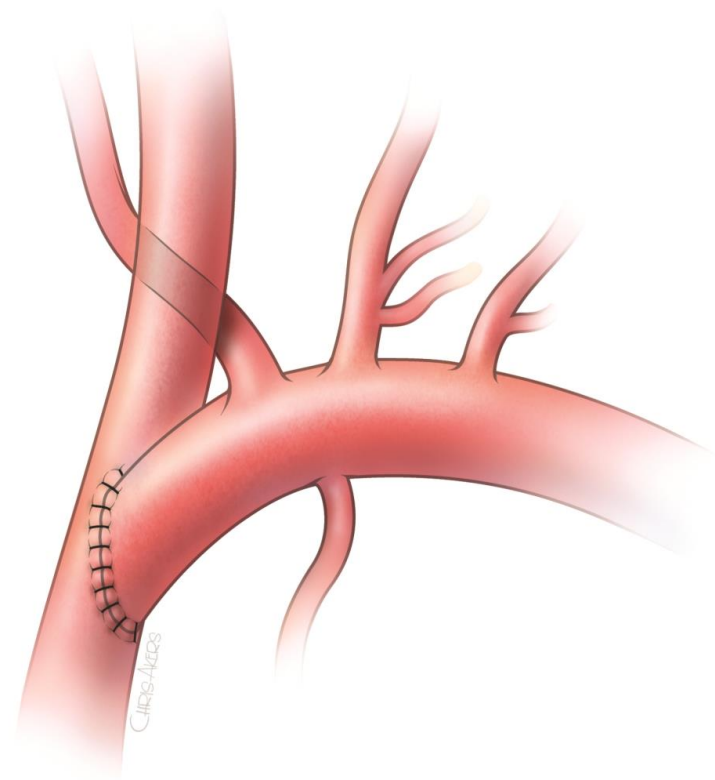
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**No Relevant Financial  
Relationship Reported**



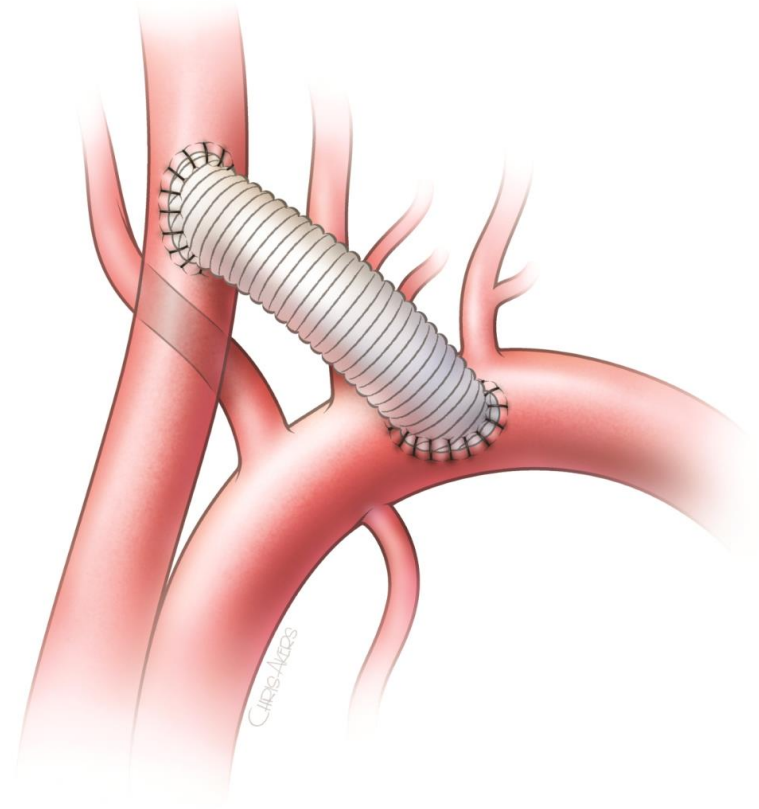
# Subclavian Artery Revascularization

- Initially performed for occlusive disease
- Now often performed to obtain proximal landing zone for thoracic endovascular aortic repair (TEVAR) and to reduce stroke and lower extremity neurologic deficit (LEND)



# Subclavian Artery Revascularization

- Roughly 40% of patients undergoing TEVAR have pathology extending near the left subclavian artery (LSA)
- Baseline risks after TEVAR with LSA coverage:
  - Arm ischemia: 6%
  - Spinal cord ischemia: 4%
  - Vertebrobasilar ischemia: 2%
  - Anterior circulation stroke: 5%
  - Death: 6%



# Subclavian Artery Revascularization

- SVS Practice Guidelines
- 3 recommendations from expert panel if left subclavian artery coverage (LSA) needed:
  - Routine TEVAR: routine preoperative LSA revascularization suggested (2C)
  - Select patients with anatomy compromising flow to critical organs: strongly recommend preoperative LSA revascularization (1C)
  - Urgent TEVAR for life threatening condition: LSA revascularization timing dependent on case by case basis (2C)

## SVS PRACTICE GUIDELINES

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### The Society for Vascular Surgery Practice Guidelines: Management of the left subclavian artery with thoracic endovascular aortic repair

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The Society for Vascular Surgery pursued development of clinical practice guidelines for the management of the left subclavian artery with thoracic endovascular aortic repair (TEVAR). In formulating clinical practice guidelines, the society selected a panel of experts and conducted a systematic review and meta-analysis of the literature. They used the grading of recommendations assessment, development, and evaluation (GRADE) method to develop and present their recommendations. The overall quality of evidence was very low. The committee issued three recommendations. *Recommendation 1:* In patients who need elective TEVAR where achievement of a proximal seal necessitates coverage of the left subclavian artery, we suggest routine preoperative revascularization, despite the very low-quality evidence (GRADE 2, level C). *Recommendation 2:* In selected patients who have an anatomy that compromises perfusion to critical organs, routine preoperative LSA revascularization is strongly recommended, despite the very low-quality evidence (GRADE 1, level C). *Recommendation 3:* In patients who need urgent TEVAR for life-threatening acute aortic syndromes where achievement of a proximal seal necessitates coverage of the left subclavian artery, we suggest that revascularization should be individualized and addressed expectantly on the basis of anatomy, urgency, and availability of surgical expertise (GRADE 2, level C). (J Vasc Surg 2009;50:1155-8.)

# Our Center

- 3° Referral Center
- Level 1 Trauma
- Multi-specialty team
  - CT, Vasc Surg
  - Critical care
  - Consultants
- Advanced imaging
  - CT, MR, IVUS, TEE
  - Hybrid OR's
- Full spectrum of open/endovascular procedures

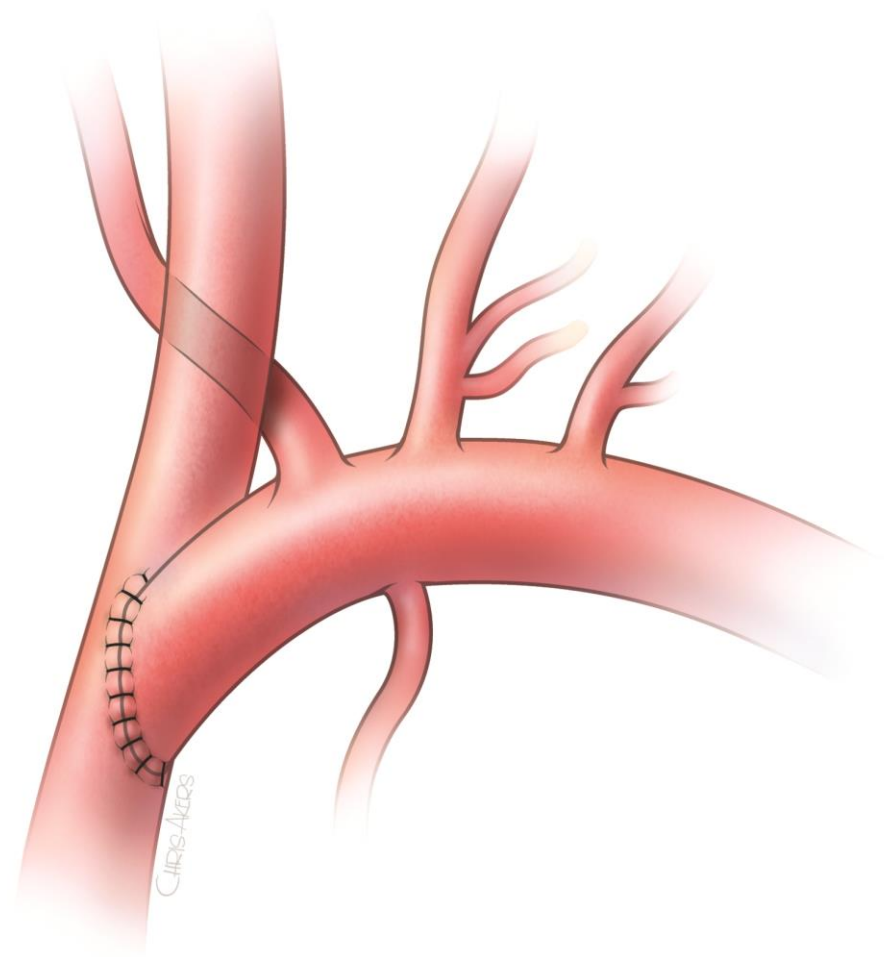


# Purpose

To determine the effect of subclavian artery revascularization (SAR) in reversing lower extremity neurologic deficit (LEND) after thoracic endovascular aortic repair (TEVAR) with subclavian artery coverage.

# Methods

- Patients who underwent SAR: 5/2001 to 6/2018 reviewed and grouped by indication/ timing
- Groups:
  - Isolated SAR: without TEVAR
  - Proactive SAR: at or before TEVAR
  - Reactive SAR: after TEVAR



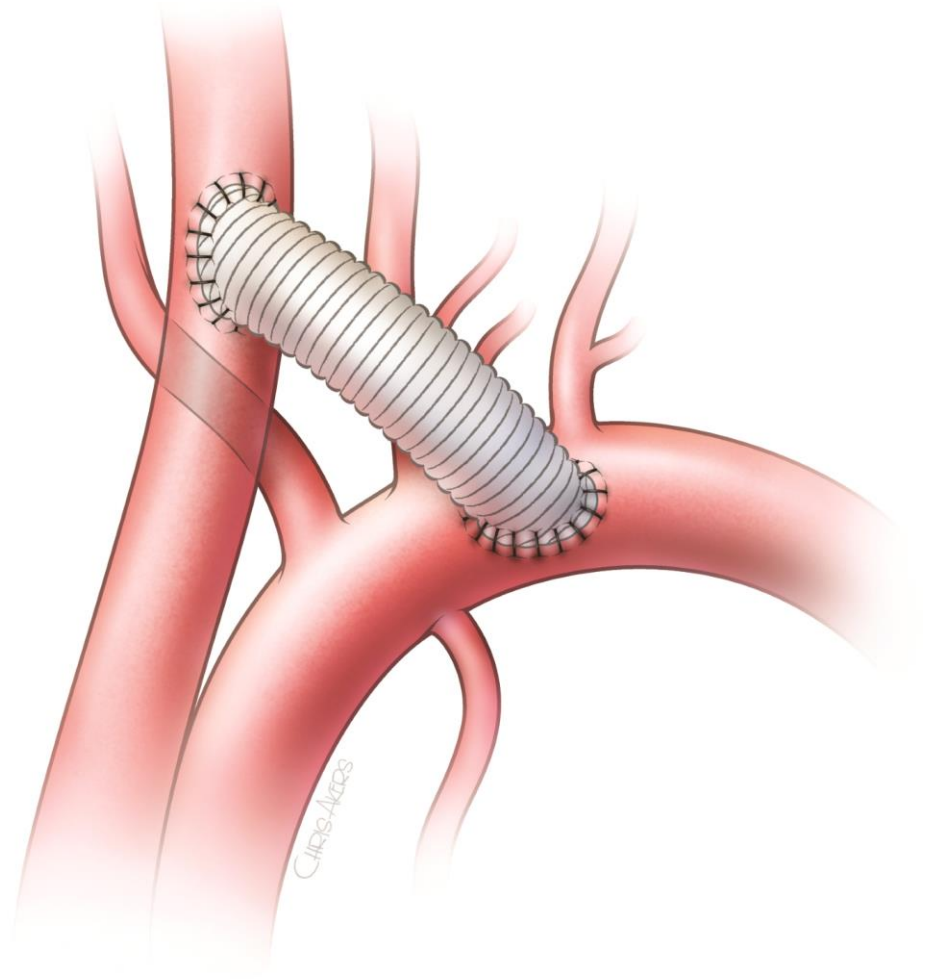


# Methods

- Composite outcome for complication:
  - Lower extremity neurologic deficit (LEND)
  - Cerebrovascular accident (CVA)
  - Myocardial infarction (MI)
  - In-hospital mortality

# Methods

- Follow up methods:
  - Medical records
  - Imaging
  - Clinic visit
  - Social Security Death Index (SSDI)



# Cohort

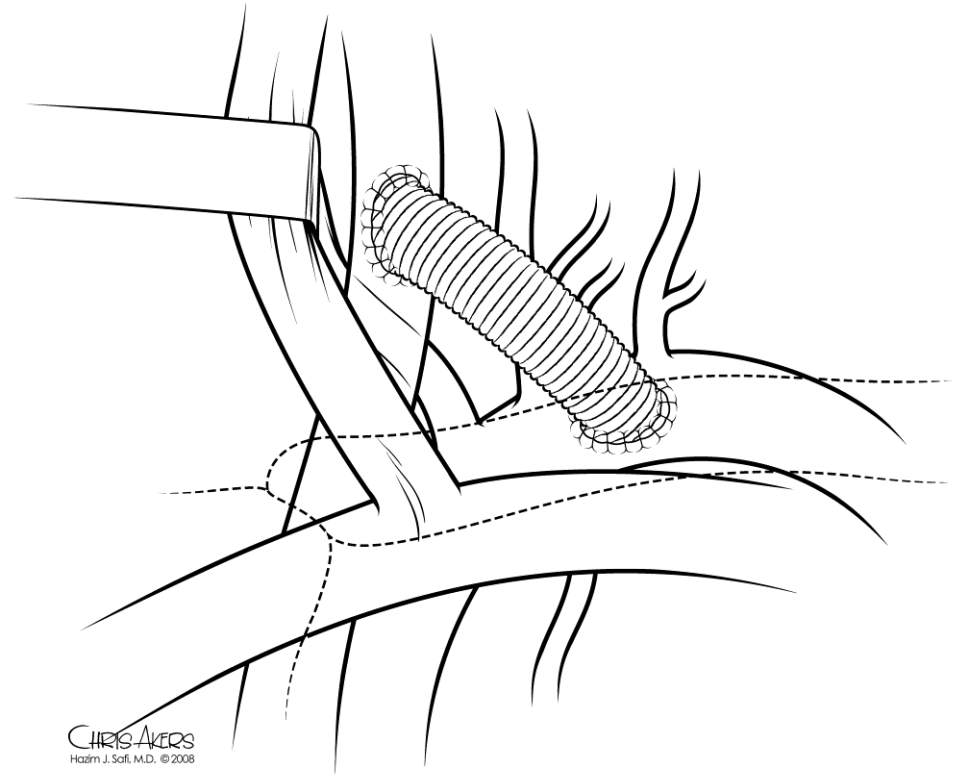
- 5/2001 to 6/2018
- 76 Subclavian Artery Revascularizations (SAR)
  - 51: Carotid- Subclavian Bypass
  - 25: Carotid- Subclavian Transposition
- 70.1% Male
- Mean age:  $63.1 \pm 13.8$  years

## Subclavian Artery Revascularization (n=76)

	Isolated SAR: SAR without TEVAR (n=9)	Proactive SAR: SAR before TEVAR (n=51)	Reactive SAR: SAR after TEVAR (n=16)	p-value
<b>LEND (%)</b>	0 (0%)	0 (0%)	6/16 (37.5%)	<0.01
<b>Permanent LEND (%)</b>	0 (0%)	0 (0%)	2/16 (12.5%)	0.02
<b>CVA (%)</b>	0 (0%)	4/51 (7.84%)	1/16 (6.25%)	0.68
<b>Myocardial infarction (%)</b>	0 (0%)	1/51 (1.96%)	0 (0%)	0.78
<b>In-hospital mortality (%)</b>	0 (0%)	1/51 (1.96%)	1/16 (6.25%)	0.56

# Isolated SAR

- 9 SAR without TEVAR
  - Isolated SAR
- Zero composite complication



# Proactive SAR

- 51 SAR before or same operation as TEVAR
  - Proactive SAR
- LEND: 0/51 (0%)
- Zero permanent LEND
- CVA: 4/51 (7.84%)
- Myocardial infarction: 1/51 (1.96%)
  - Only post-op MI in cohort: 1/76 (1.32%)
- In-hospital death: 1/51 (1.96%)

# Reactive SAR

- 16 SAR after TEVAR
  - Reactive SAR
- LEND: 6/16 (37.5%)
- Permanent LEND: 2/16 (12.5%)
- CVA: 1/16 (6.25%)
- Zero Myocardial infarction
- In-hospital death: 1/16 (6.25%)

# LEND

- LEND significantly higher in Reactive SAR group versus Isolated and Proactive SAR groups:
  - 37.5% versus 0% and 0%, respectively
  - $P < 0.01$
- Permanent LEND significantly higher in Reactive SAR group versus Isolated and Proactive SAR groups:
  - 12.5% versus 0% and 0%, respectively
  - $P = 0.02$

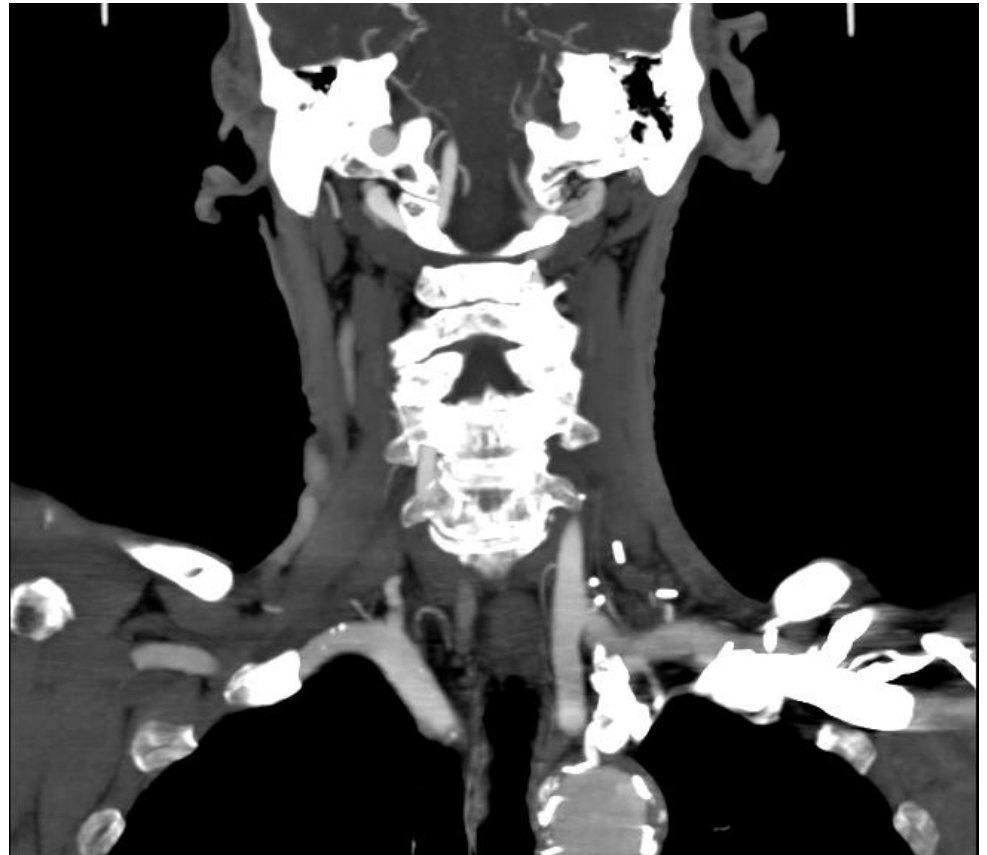


# LEND

- Proactive SAR appears superior to delayed revascularization with 0% permanent LEND versus 12.5% in Reactive SAR group ( $p=0.02$ ).
- However, with LEND after TEVAR with subclavian artery coverage, prompt SAR appears to restore neurologic function in many patients in conjunction with CSF drainage:
  - 2/16 (12.5%) versus 6/16 (37.5%)

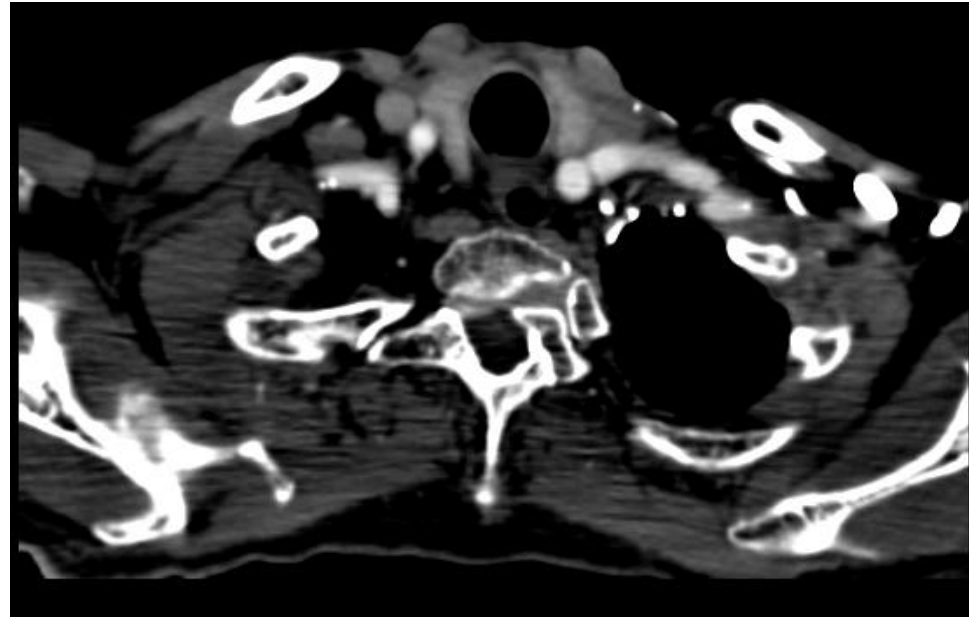
# CVA

- No significant difference in CVA between groups:
  - A: 0/9 (0%)
  - B: 4/51 (7.84%)
  - C: 1/16 (6.25%)
- $p=0.68$



# MI

- Post-operative MI rare
  - 1/76 (1.32%) entire cohort
- No significant difference between groups
  - $p=0.78$



# In-hospital Mortality

- Overall In-hospital mortality: 2/76 (2.63%)
- No significant difference between groups
  - $p = 0.56$

# Overall Complication Rate

No difference was noted in overall complication rates between Isolated, Proactive and Reactive SAR groups ( $p=0.35$ )

# Failed Predictors of Complication

- Sex ( $p=0.59$ )
- Diabetes ( $p<0.07$ )
- Aortic dissection ( $p<0.72$ )

# SAR: Bypass Vs. Transposition

No significant difference in complications between  
carotid-subclavian bypass versus transposition  
( $p=0.48$ )

# Conclusion

- Outcomes after SAR are acceptable but with increased CVA noted in TEVAR cases.
- Prompt SAR in patients with LEND after TEVAR appears effective in restoring neurologic function in many patients in conjunction with CSF drainage.
- Outcomes are superior after prophylactic SAR when subclavian coverage is needed during TEVAR.



Thank You

