Subclavian revascularization: how to handle the occluded subclavian

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Advanced Interventional & Vascular Services LLP
Disclosure

John H Rundback MD

I have the following potential conflicts of interest to report:

Compensated Board Member – VIVA Physicians Inc.
Non-compensated Investigator – Pluristem, Intact, Bard, Medtronic, Boston Scientific, Surmodics, Micromedical
Equity – Eximo
Clinical presentations

- **Incidental**
  - Subclavian steal
    - Vertebrobasilar insufficiency (vertigo, diploplia, imbalance)
    - Arm claudication, diminished arm pulses, muscle wasting (75% left side)

- **Coronary steal**
  - Post LIMA/RIMA, angina or MI

Cua J Card 2017
Technical considerations

- Access site -- radial, femoral, both (snare/rendezvous)
- Wire type – 0.014/0.018/0.035, tip weight, hydrophilic
- BES or stent graft
- Sequential dilation
- Generally no DEP
- Don’t treat — potential vertebral or IMA compromise, dense Ca++, uncertain wire course
- TEVAR/long lesion/subintimal →

Ahmed CV Int Rad 2016: Inc tech results, NOT patency or clinical outcomes
Access site

**Femoral**
- most cases
- easier to visualize arch
- long angled sheath/guide
- occasional second control catheter for aortic imaging

**consider reactive hyperemia to promote arm flow**

**Radial (combined)**
- no femoral access
- aortoiliac dz
- type 3 arch
- fTEVAR
- occlusions

**transradial vasodilator to promote arm flow**
VERTIGO
Able to cannulate origin from arch → favorable femoral treatment
Catheter choices — headhunter, tapered/non-tapered angled glidecatheter, Berenstein, Kumpe

Avoid engaging lesion with catheter

Note to-and-fro flow in vertebral
Provocative maneuvers can confirm hemodynamic significance of lesion.

WITH HAND EXERCISE
Balloon expandable stent

From femoral approach prefer 0.018” or 0/035” (Rosen) wires
CORONARY STEAL
Radial Approach
Trans-radial retrograde angiogram.
Retrograde wire diverts to media.

Antegrade angiogram
Snare wire and cross with 6 or 7 Fr sheath
Position stent

Position stent inside sheath

Retract sheath and do test injections to make sure
Final
Delay in vertebral flow reversal

.014 inch Doppler flow wire in the vertebral artery

4 French Catheter via left brachial
### Table V. Summary of subclavian studies

<table>
<thead>
<tr>
<th>First author</th>
<th>Year</th>
<th>Arteries, No.</th>
<th>Patients, No.</th>
<th>Stent, PTA, or % stent</th>
<th>Follow-up (mean/median)</th>
<th>Patency, %</th>
<th>Patency follow-up, months</th>
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<tr>
<td>Sullivan</td>
<td>1998</td>
<td>66</td>
<td>66</td>
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<td>Mean, 12.9 months</td>
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<td>Schillinger</td>
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<td>Median, 44 months</td>
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<td>26</td>
<td>Stent</td>
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<td>de Vries</td>
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<td>1.4 ± 15.5 months</td>
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<td>4 years</td>
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<td>Sixt</td>
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<td>9-20 months</td>
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<td>9-20 months</td>
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<td>98.7</td>
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*PTA, Percutaneous transluminal angioplasty.*

≈ 70-90% primary patency
Subclavian Artery Stenting: In-Stent-Restenosis

Table IV. A, Significant predictors of in-stent restenosis (ISR)

<table>
<thead>
<tr>
<th>Variables</th>
<th>HR</th>
<th>Lower</th>
<th>Upper</th>
<th>P</th>
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<tr>
<td>Smoking/COPD</td>
<td>3.2</td>
<td>1.6</td>
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<td>Age (by decade)</td>
<td>0.5</td>
<td>0.4</td>
<td>0.7</td>
<td>&lt;.001</td>
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<tr>
<td>Discharge statin</td>
<td>0.3</td>
<td>0.2</td>
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<td>Vessel diameter &lt;7 mm</td>
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<tr>
<td>Right-sided intervention</td>
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<td>0.1</td>
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<td>.040</td>
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</table>

CI, Confidence interval; COPD, chronic obstructive pulmonary disease; HR, hazard ratio.

OCCLUSIONS not a restenosis risk?
Carotid Subclavian Bypass

- Supraclavicular incision
- Prosthetic graft
- Non-traversable lesion
- Juxta-vertebral (or distal)
- Risks:
  - Death 1%
  - Nerve injury 9%
  - Lymph leak 2%
  - Infection 1%
  - Hematoma 1%

### Carotid-Subclavian Bypass Outcomes

*Patency of subclavian carotid transposition compared with carotid subclavian bypass, $\chi^2 = 69 \; (P < .0001)$.  
†Patency of carotid subclavian bypass with vein compared with carotid subclavian bypass with graft, $\chi^2 = 11.7 \; (P = .0006).$

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Patients</th>
<th>Synthetic Graft</th>
<th>Primary Patency</th>
<th>5-Year Patency</th>
<th>10-Year Patency</th>
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<td>yes</td>
<td>46.9 (2-124)</td>
<td>86 (83-89)†</td>
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<td>Perler, 1990</td>
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<td>42 (1-121)</td>
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<td>AbuRahma, 2000</td>
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<td>92.4 (12-228)</td>
<td>92</td>
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\[ \approx 80-90\% \text{ primary patency} \]
Endovascular And Surgical Management Of Subclavian Artery Occlusive Disease: Early And Long Term Outcomes.

Benhammamia M, Mazzaccaro D, Ben Mrad M, Denguir R, Nano G.

Sixty-eight patients ER (49 patients) and OSR (19).

Technical success rate was 100% in both groups.

Cxs: 1 brachial hematoma (ER) and 2 acute upper limb ischemia (OSR).

Symptoms resolution and upper limb salvage were 100% in both groups.

Primary Patency @ 7 years:

(ER) 100% for stenotic lesions and 62.5%+21.3% for occlusive lesions (P=0.0035).

(OSR) 100% for stenotic lesions and 25%+21.6% occlusive lesions (P<0.0001).

Overall, combined long-term primary patency in the OSR group was 76.9%+11.7% at 7 years, and after ER (93.4%+4.5%P=0.02).
Conclusions

- Sublavian stenoses/occlusions are uncommon but important lesions
  - Treat when symptomatic
- Specific surgical and endovascular indications
  - Mostly transfemoral but increasingly radial
  - Diligent intervention
Subclavian revascularization: how to handle the occluded subclavian

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