

Carotid artery stenting for symptomatic high risk carotid artery stenosis

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Patient History

- 72 year old male with an extensive history of CVD
- PMH:
 - H/o of CABG x 3 in 2007.
 - Ischemic CM: EF 25 %.
 - H/o ICD for primary prevention.
 - Chronic renal disease. Cr 2.5.
- Extensive history of PAD.
- Ho of salivary gland tumor: adenoid cystic carcinoma, treated with radiotherapy.
- Current Smoker: > 4 ppd.
- No h/o of ETOH or drug use.



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Presentation

- Presented with TIA like symptoms (left upper arm motor weakness/sensory loss) x 2 over 6 months.
- Each self resolved within 24 hrs.
- Work up demonstrated no LV/LAA clots.
- 4 week event monitor showed no Afib.
- Hypercoagulable workup was negative.
- DUS of BL carotids done as part of the work up for TIAs.
- Seen and evaluated by a stroke neurologist.



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Carotid US Velocities

Right			Left			
Stenosis	PSV (cm/sec)	EDV (cm/sec)		PSV (cm/sec)	EDV (cm/sec)	Stenosis
> 70 %*	346	101	P ICA	73	23	patent
> 50 %	303	40	P ECA	81	23	patent
patent	67	23	P CCA	46	15	patent
patent	59	13	D CCA	56	16	patent

> 5.1*	ICA/CCA ratio	1.5
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*Society of Radiologists in Ultrasound Consensus Criteria for Carotid Stenosis.

Grant EG, Benson CB, Moneta GL, et al. Carotid artery stenosis: grayscale and Doppler ultrasound diagnosis--Society of Radiologists in Ultrasound consensus conference. Radiology 2003; 229:340-346.



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Evaluation

- Referred to vascular surgery.
 - Considered high risk for carotid endarterectomy*.
 - Referred for carotid artery stenting.
- History of neck radiation*
 - High risk of peri-operative stroke and death with greater than 6 % risk.
 - High risk of anesthesia and surgery given multiple co morbidities.

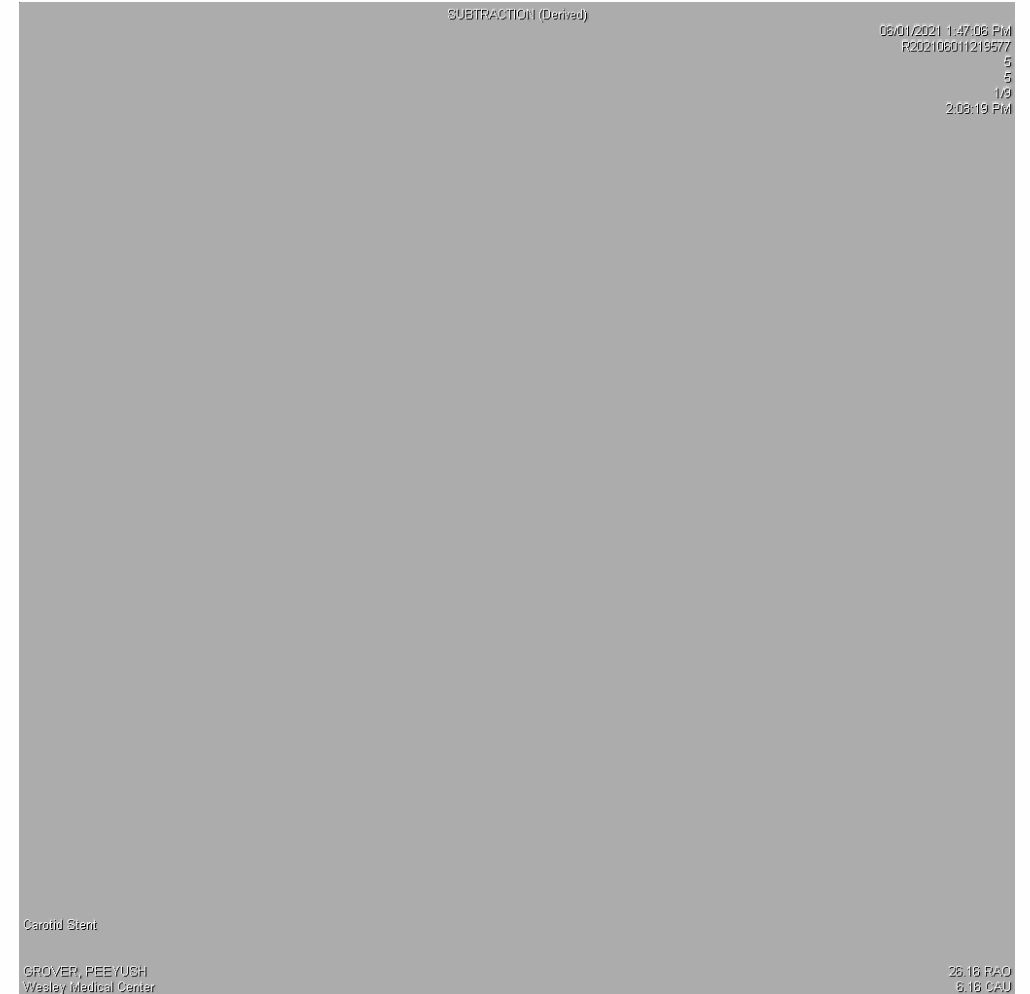


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Diagnostic Angiogram

- Type I aortic arch
- Greater than 70 % stenosis p ICA.
- NASCET criteria used
- High degree of thrombus burden.



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Best treatment options ?

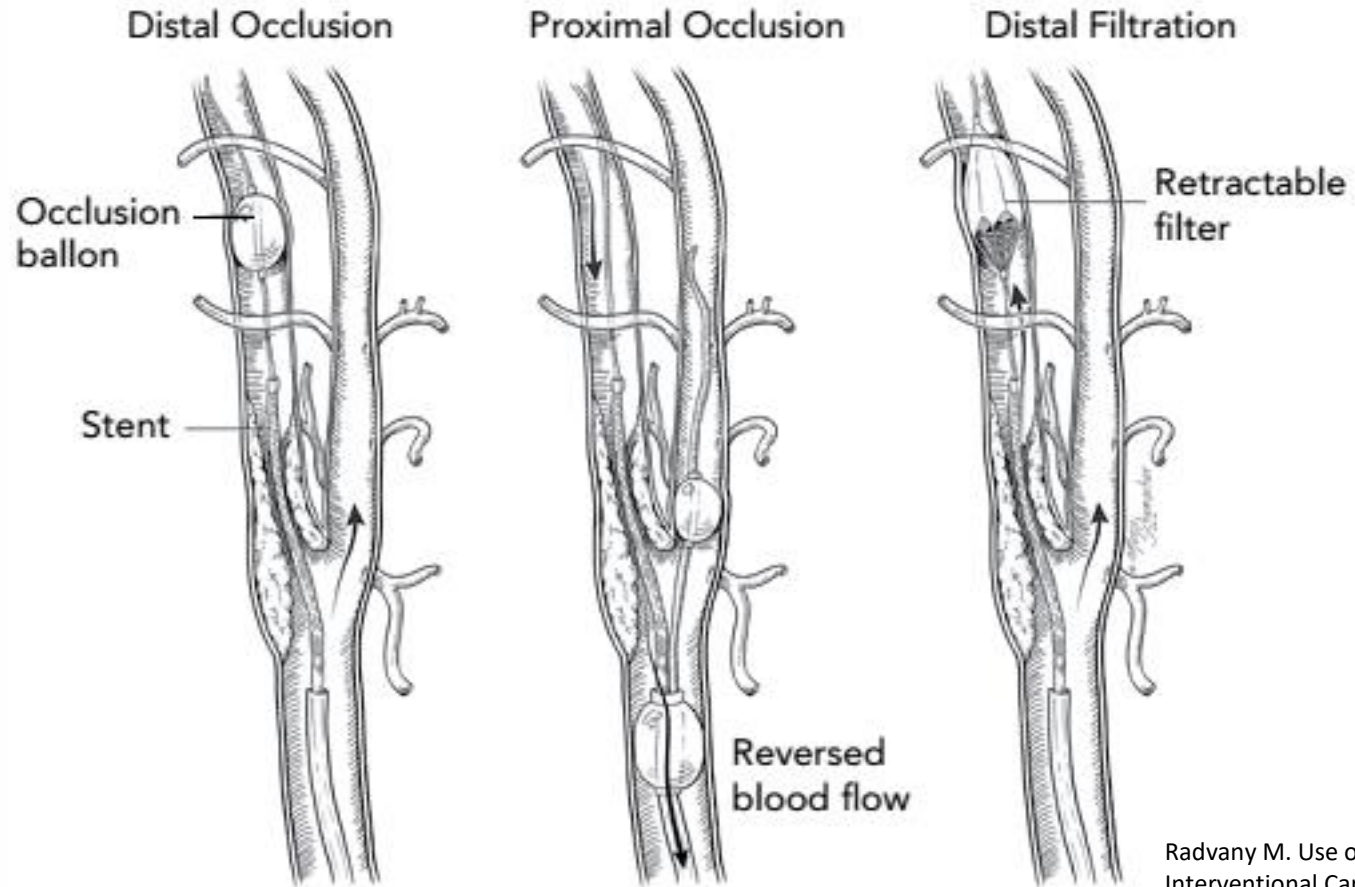
- a. Carotid artery stenting with distal embolization protection device.
- b. Carotid artery stenting with proximal cerebral protection device.
- c. Trans Carotid Artery Revascularization (TCAR).



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Approaches Used to Reduce Distal Embolisation During Carotid Stenting



Radvany M. Use of embolic protection devices in peripheral interventions. *Interventional Cardiology Review* 2017. 12(1): 31-5.



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Carotid Artery Stenting

- A 6 x 90 destination sheath
- A NAV -6 filter for distal EPD
- Heparin used for periprocedural AC

Carotid Stent

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Next step ?

- a. Predilatation with a SC or NC balloon.
- b. Direct stenting with a closed-cell stent design.
- c. Direct stenting with an open-cell stent design.



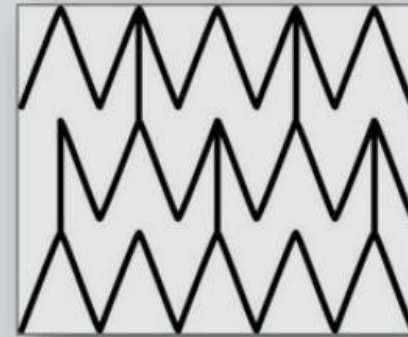
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Open Cell vs. Closed Cell

Open Cell:

- *More flexible*
- *Conforms to vessel wall better*
- *Less metal in smaller vessels*



Closed Cell:

- *More radial force*
- *Greater plaque coverage*



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Carotid Artery Stenting

- Direct stenting with an Xact 8-10 mm tapered stent.
- No pre dilatation performed.

SUBTRACTION (Derived)

06/01/2021 1:47:06 PM
R202106011219577
7
1/10
2:20:21 PM

Carotid Stent

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Best next step ?

- a. Finish procedure and remove device.
- b. Post dilatation with a NC balloon.
- c. Wire the ECA prior to Post dilatation.



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Carotid Artery Stenting

- Post dilated x 1 with a NC Balloon.
- Reduced Flow seen in the ECA.

SUBTRACTION (Derived)

08/01/2021 1:47:08 PM
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8
8
1/10
2:25:05 PM

Carotid Stent

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26:18 RAO
6:16 CAU



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Best next step ?

- a. Finish procedure and remove device.
- b. Call a stroke alert.
- c. Try to rescue the ECA.
- d. Continue with PD more aggressively.



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Final result

- Sheath and device removed.
- Patient reported jaw numbness and facial tingling along the right side after the procedure.
- Reported no other symptoms.
- Symptoms improved next day.
- Interventional neurology involved.
- Conservative management agreed upon.



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Transcarotid artery revascularization

- Specific technique that accesses the carotid through a short incision at the base of the neck over the proximal ipsilateral common carotid artery.
- Performed through a short carotid sheath in conjunction with flow reversal for embolic protection.
- Benefits of avoiding a potentially diseased aortic arch with a low rate of distal embolization.



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TCAR vs TF-CAS

- TCAR procedure data: safety and efficacy studies, institutional reports, and real-world outcomes found in registries.
- A study from the Vascular Quality Initiative demonstrated a significantly lower incidence of in-hospital stroke and death in patients treated with TCAR versus TF-CAS 1.6% vs 3.1% (RR 0.51, 95% CI 0.37-.72).¹
- Propensity score matched 6,384 pairs of patients who had undergone either TCAR or CEA. There was no difference in in-hospital stroke and death between symptomatic patients undergoing TCAR versus CEA (2.2% vs 2.6%, $p=.46$)²



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1. Schermerhorn ML et al. Association of Transcarotid Artery Revascularization vs Transfemoral Carotid Artery Stenting With Stroke or Death Among Patients With Carotid Artery Stenosis. JAMA. 2019.
2. Malas MB et al. TransCarotid Revascularization with Dynamic Flow reversal versus Carotid Endarterectomy in the Vascular Quality Initiative Surveillance Project. Ann Surg. 2020.

Society for Vascular Surgery Guidelines¹

- TCAR procedure is at least equivalent to CEA, with some potential improvements.
- Compared with TF-CAS, the overall data demonstrate better outcomes.
- TCAR may be preferable to CEA and TF-CAS for high-risk patients (anatomic and physiologic)

1. AbuRahma AF et al. SOCIETY FOR VASCULAR SURGERY CLINICAL PRACTICE GUIDELINES FOR MANAGEMENT OF EXTRACRANIAL CEREBROVASCULAR DISEASE. J Vasc Surg. 2021



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Hospital Course and Follow-Up

- Did well post procedure.
- Discharged after 2 days of observation.
- Started on plavix with low dose rivaroxaban.
- Repeat DUS 4 weeks post procedure demonstrated patent stent in the RICA and flow in the ECA.
- 6 month follow up: no recurrent TIAs.



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Conclusions and Learning Points

- CAS is a good alternative to CEA in high-risk symptomatic carotid artery disease patients.
- EPD should be used in all CAS procedures.
- TCAR may be preferable in certain patients with favorable anatomical features over TF-CAS.



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