

The TCAR Revolution

BY PETER A. SCHNEIDER, MD

It is not often that a specific approach to therapy comes along and rapidly changes the way we think about or manage a major vascular disease process. Previously, such leaps of progress have included the introduction of stents, endovascular aneurysm repair, and peripheral drug delivery. Within these leaps of progress, there is typically an introduction of the innovation followed by a developmental process, during which the skills and devices are gradually improved, and the therapy is standardized.

Transcarotid artery revascularization (TCAR) has changed the way we evaluate patients with carotid disease. TCAR permits endovascular access with avoidance of the aortic arch and the establishment of protection prior to crossing the lesion. It also results in more complete particle capture than previous protection technologies. The intolerance rate is very low, as oxygenated blood is entrained into the target hemisphere through the process of flow reversal, a concept that may not immediately seem intuitive upon first evaluation. Although any major therapy innovation is an uncommon event, the vascular field has particularly never witnessed the actual quantitative evaluation of the rollout and developmental process so early in the life cycle of the procedure as has occurred with TCAR. The Vascular Quality Initiative TCAR Surveillance Project (VQI-TSP) records all cases, including the learning curve for each physician and institution. There are no “lead-in” cases prior to data entry, hence, the TSP captures all patients, complications, and outcomes regardless of the experience of the treating physicians.¹

Carotid endarterectomy (CEA) has been developed and refined for more than 6 decades and transfemoral carotid stenting (TF-CAS) for more than 2 decades. Results have been excellent with these therapies in the hands of many interventionalists. The comparative data from the past 15 years are well known and have taught us much about carotid disease. Substantial time and effort have gone into refining these therapies, and they will remain in our armamentarium. The introduction of an option like TCAR, which will serve as an alternative to established therapy in certain patients, and ultimately be complementary to our disease management algorithms,

must be followed by well-developed rationale and data sets. The results must speak for themselves.

We have also learned that new white lesions on diffusion-weighted MRI (DW-MRI) can be used as a surrogate for neurological risk in these various procedures. DW-MRI lesions for TF-CAS range from 45% to 87%, and range for CEA from 12% to 25%.²⁻⁴ When TCAR was evaluated in the PROOF study, DW-MRI new white lesions occurred in 18%, which is fairly consistent with CEA.⁵ This may help to explain why the results of TCAR, especially early in its evolution, are on par with, and in some ways, better than established therapies.⁶

New therapies bring new challenges. Avoiding access site injuries such as common carotid artery dissection is key to procedural safety. Deliberate lesion evaluation helps to select patients with carotid disease that are amenable to stent placement, and much of this knowledge has carried over from experience with TF-CAS. Although none of the procedural steps are new or foreign to us, they must be done in the correct sequence and with tight specifications and little leeway for error.

In summary, TCAR is an innovation that has changed the landscape in carotid therapy. ■

1. Malas M. Outcomes of Transcarotid Revascularization with Dynamic Flow Reversal Versus Carotid Endarterectomy in the Transcarotid Revascularization Surveillance Project. Presented at: SVS Vascular Annual Meeting; National Harbor, Maryland; June 12-15, 2019.
2. Bonati L, Jongen LM, Haller S, et al. New ischaemic brain lesions on MRI after stenting or endarterectomy for symptomatic carotid stenosis: a substudy of the International Carotid Stenting Study (ICSS). *Lancet Neurol*. 2010;9:353-362.
3. Bijuklic K, Wandler A, Hazzi F, Schofer J. The PROFIL study (prevention of cerebral embolization by proximal balloon occlusion compared to filter protection during carotid artery stenting): a prospective randomized trial. *J Am Coll Cardiol*. 2012;59:1383-1389.
4. Gargiulo G, Sannino A, Stabile E, et al. New cerebral lesions at magnetic resonance imaging after carotid artery stenting versus endarterectomy: an updated meta-analysis. *PLOS ONE*. 2015;10:e0129209.
5. Pinter L, Ribo M, Loh C, et al. Safety and feasibility of a novel transcervical access neuroprotection system for carotid artery stenting in the PROOF study. *J Vasc Surg*. 2011;54:1317-1327.
6. Kashyap V. ROADSTER-2 study results. Presented at: SVS Vascular Annual Meeting; National Harbor, Maryland; June 12-15, 2019.



Peter A. Schneider, MD

Professor of Surgery
Division of Vascular and Endovascular Surgery
University of California at San Francisco
San Francisco, California
peteraschneidermd@gmail.com
Disclosures: Proctor and TEST DRIVE faculty for Silk Road Medical.