Playing Nice in the TCAR Sandbox

How to start and run a strong multidisciplinary TCAR program.

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The transcarotid artery revascularization (TCAR) procedure was developed by vascular surgeons for vascular surgeons. Right? Well, like everything, it's complicated! As the era of transfemoral stenting goes by the wayside, given poorer stroke and complication rates, most vascular surgeons graduating from training programs in the United States do not meet hospital credentialing criteria for carotid stenting privileges due to low volume. Because of this, it can become difficult and political when attempting to start a TCAR program if the surgeon does not have carotid stenting privileges. Although one could argue that credentialing TCAR is very different than the transfemoral approach, despite this, roadblocks are everywhere and can seem daunting to a new attending surgeon. Without surgical training, TCAR cannot be performed, placing interventional cardiologists and radiologists in a difficult position to become capable of performing these procedures. We, at Lancaster General Hospital (LGH) in Lancaster, Pennsylvania, have approached TCAR in a multidisciplinary fashion, which we have found to be very rewarding. We share our experiences with the hope of expanding national viewpoints to performing TCAR across multiple disciplines.

PROFESSIONAL STRUCTURE AND HOSPITAL CREDENTIALING

We are both employed physicians in separate practices but overall practice ownership is by the same system: Lancaster General Health, part of University of Pennsylvania Medicine. Cumulatively, we have performed 96% of our institution's cases, with the other 4% performed by two vascular surgeons and one interventional radiologist who are also credentialed in TCAR.

Dr. Dermody is a vascular surgeon who trained at the time TCAR received FDA approval, but never performed the procedure in her training and had < 10 transfemoral carotid stenting cases logged at the completion of her 2-year fellowship. She is board certified in general and vascular surgery. She currently serves as the Chief of the Division of Vascular Surgery and is the Co-Medical Director for the Interventional Vascular Unit at LGH.

Dr. Wood is an interventional cardiologist who did an additional vascular/endovascular medicine fellowship with extensive transfemoral carotid stenting training. He is board certified in cardiology, interventional cardiology, vascular medicine, and endovascular medicine. He currently serves as the Chief of the Division of Cardiology and Chief Medical Officer of the Heart and Vascular Institute.

When carotid stenting emerged as an entity, our institution addressed the "political" aspects of ownership of this field by stipulating a universal standard for carotid stenting privileges overseen by a governing body called the Multi-Disciplinary Angiography Committee (MDAC) outside of individual departmental/divisional control. Representation includes vascular surgery, interventional cardiology, interventional radiology, neurosurgery, and cardiothoracic surgery with a rotating chair. With the advent of TCAR and prior to any societal guidelines, this committee directed that TCAR requires inclusion of an operator with carotid stenting privileges via criteria outlined in previous multisocietal consensus documents. This position was further justified by the Centers for Medicare & Medicaid Services (CMS) reimbursement decision that TCAR falls under carotid stenting billing codes. MDAC is responsible for our TCAR program oversight and quality review.

PREOPERATIVE COORDINATION

Once a patient has been diagnosed with carotid stenosis and referred to vascular surgery, the surgeon's office coordinates scheduling the operation, ordering (and following up) preoperative lab work, and obtaining insurance authorization. The surgeon also orders any necessary antiplatelet medication and coordinates cessation of other anticoagulation, as needed. Our collaborative involvement allows for nuanced management of antiplatelets and anticoagulants on the fly without necessitating separate cardiology/hematology/primary care consultation. Preoperative cardiac consultation is rarely required with direct cardiology involvement and for us has been limited to very high-risk cardiac patients, such as advanced heart failure.

If a patient is already followed by cardiology, generally speaking, carotid ultrasounds are performed through their practice until the study indicates severe stenosis. At this time, the cardiologist will usually evaluate the cases with Dr. Wood and order a CTA neck prior to referring the patient to surgical consultation. It is notable that this operational relationship has essentially captured the referral stream of nearly 30 cardiologists and their 20 nurse practitioners, as well as an almost 100% conversion of Dr. Wood's prior transfemoral carotid stenting cases over to TCAR. In a similar light, approximately 80% of Dr. Dermody's carotid interventions are now performed via TCAR rather than endarterectomy.

Should a patient present to the hospital with an acute stroke due to symptomatic carotid stenosis, the neuroradiology team will often consult surgery for TCAR planning. In these cases, we usually coordinate the procedure with an interventional radiologist to keep established care paths in line. Given the lack of blocked hybrid operating room (OR) time at our institution, the surgeons' and interventionalists' procedure schedulers work together months in advance to coordinate set days in the OR for TCAR procedures to occur. We usually book four procedures per day and have, on average, 3 full days per month to perform TCAR.

INTRAOPERATIVE NUANCES

We perform nearly every TCAR under conscious sedation with either propofol or dexmedetomidine infusion and local anesthesia to the tune of 80% of total cases to date, with most of the 20% general anesthesia cases being early experience cases. After the time out, ultrasound is used to visualize the common carotid artery (CCA) and bifurcation, in an effort to plan out the incision. The surgeon begins with the carotid artery dissection. During this time, the interventionalist obtains ultrasound-guided contralateral femoral venous access. Once the artery is ready for puncture and systemic anticoagulation has been established, the surgeon punctures the CCA and threads the wire. The interventionalist assists in retracting the artery and manipulating the J wire during the sheath placement, making the most of short runways. With that, and with other two-operator techniques such as "telescoping" the sheath over a fixed position dilator, we are able to use a stop-short technique 80% of the time, which is well above the national average. Once in place, we switch sides of the table and the interventionalist takes over with angiography and wiring the lesion after clamp placement by the surgeon. The interventionalist performs the endovascular portion of the procedure; however, selection of the balloon and stent sizes is mutual. Wire management and equipment exchanges are brisk, with two sets of experienced hands manning the intervention. We have adopted some coronary techniques, including the use of high-pressure coronary noncompliant balloons for calcified lesion preparation and to deliver focused force on the underexpanded portion of the stent to avoid "dog-bone" balloon expansion. We also have a very low threshold to postdilate, particularly in the presence of calcium, performing pre and postdilation 76% of the time; again, well above national average. The use of coronary balloons also affords very precise sizing with balloons available down to quarter millimeter increments. We have experienced zero dissections or other balloon-related complications with our approach. We also have a wealth of 0.014-inch wires available from the coronary space but tend to use the provided wire predominantly. We have incorporated the use of a metal wire introducer, commonly used in cath labs with a Touhey, to significantly reduce the friction on the wire. This "defeats" the sheath's hemostatic valve, greatly improving torque control of the wire and ease of lesion traversal. After stent deployment and possible poststent angioplasty, the clamp is removed and we switch sides of the table again. Protamine is started during this time. The access is then removed by the surgeon who ties the purse-string suture down, obtains hemostasis, and closes the incision. During incision closure, the interventionalist removes the venous sheath and holds manual pressure. The incision is usually closed around the time that hemostasis is obtained in the groin, which allows for less overall operative time.

POSTOPERATIVE MANAGEMENT

The surgeon writes all postoperative orders and dictates a standard operative note. The interventionalist dictates the angiography portion of the procedure within our imaging software application (McKesson). The patient is admitted to the vascular surgery service, which solely takes care of the patient postoperatively through discharge and follow-up. An ultrasound of the stent is ordered 3 weeks postop and is usually coordinated with same-day surgical

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follow-up. The patient is only referred back to cardiology if there is a chronic cardiac condition already being followed, in which case all subsequent carotid ultrasounds are done through the cardiologist's office. Otherwise, surveillance imaging is done through the surgeon's office indefinitely.

BILLING/CODING

Given concomitant employment, billing attribution is largely a spread sheet accounting effort. We have adopted a 60/40 surgical/interventionalist cost center split relative to professional and technical fee attribution. Relative value unit (RVU) allocation uses a shadow-charting attribution of RVUs for the 2nd operator by our institution.

LGH OUTCOMES

Since beginning our program in July 2018, we have had 100% technical success after 88 TCAR procedures to date. Our average procedure time is 53.4 minutes, average flow reversal time is 10 minutes, and our stroke rate is 0%. One patient had a contralateral stroke in the postoperative period and was ultimately deemed to have a cryptogenic (possibly undiagnosed cardiac) source for her bilateral embolic strokes. We also had a symptomatic patient with an ipsilateral transient ischemic attack event after TCAR who refused MRI due to claustrophobia but never had another event thereafter. We currently place JP drains and reverse heparin in all patients to avoid pocket hematomas, although the JP drain is likely superfluous with protamine reversal.

Given that we all treat a similar population of patients, our multidisciplinary approach to care goes beyond carotid disease. We have successfully built a system-wide abdominal aortic aneurysm screening and remote monitoring program, we have a streamlined referral process for a vascular rehab walking claudication program, and we are piloting a claudication screening tool in the cardiology practice. Our vascular imaging services utilize the same protocols and Intersocietal Accreditation Commission (IAC) accreditation, even sharing sonographer allocation, when needed.

Above all else, it is important for anyone who is considering initiation of a TCAR program to remember that there are several subspecialists with extensive carotid stenting experience that are excellent resources for surgeons without case numbers to support credentialing. Although we respect the fact that it does take a certain personality type to be able to work well together in teams, we truly believe that this approach is ideal for the care of our patients and ultimate program and procedural success. ■