PANEL DISCUSSION

Endovascular Therapies for TASC C and D Femoropopliteal Disease

Prof. Ramon L. Varcoe asks Drs. Herbert D. Aronow, Darren B. Schneider, and Sabine Steiner about current evidence for treatment of TASC C and D lesions, their preferred access and approach to advanced disease, if lesion location affects decision-making, and which new therapies hold promise for treating these complex lesions.

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Prof. Varcoe: How would you summarize the evidence for what we currently know about endovascular therapies for TransAtlantic Inter-Society Consensus (TASC) C and D femoropopliteal lesions?

Dr. Schneider: We have learned a lot about endovascular therapy for femoropopliteal lesions over the past decade, but we still need better data on long lesions, specifically TASC D lesions, from prospective studies. In clinical practice, treatment of long femoropopliteal lesions is common, yet most device trials specifically exclude patients with lesions > 20 cm. The data we have come from just a handful of prospective device studies, as well as single-institution and other "real world" reports. We also need more comparative studies. The data we do have clearly suggest there is a role for certain endovascular therapies using drug elution, newer-generation stents, or covered stents for the treatment of TASC C and D femoropopliteal lesions and that endovascular therapy may be comparable to surgical bypass.

Dr. Steiner: Over the last few years, we have seen expanding clinical evidence for endovascular revascularization of complex femoropoliteal lesions. Promising results were found for several treatment options, in particular drug-eluting technologies, often reporting patency rates ≥ 80% and reintervention rates < 10% after 12 months. However, existing trials for TASC C and D femoropopliteal lesions were mostly performed with a noncomparative design as single-arm or cohort studies, and long-term follow-up data are limited. So far, the optimal strategy for durable outcomes has not been determined, and most studies focused on claudicants rather than a population with chronic limb-threatening ischemia (CLTI). In addition, limited evidence is available for the combination of devices for plaque modification and lesion preparation with subsequent antiproliferative drug delivery with and without stent implantation, especially in complex TASC C and D lesions. This is essential, as this combination plays a major role in clinical routine for complex lesions.

Dr. Aronow: To be honest, I find the TASC system somewhat outdated given the evolution of devices and technical approaches that have occurred since it was first created. The classification is somewhat heterogeneous as well, and some components remain challenging despite these advances, while others (eg, vessel calcification) pose less of a challenge than they once did. I also think that there are important nonanatomic factors (eg, patient comorbidities) that may drive some of our treatment decisions and outcomes that are not captured by TASC. The aforementioned notwithstanding, it is noteworthy that patients with TASC C and D lesions are often excluded from randomized and other trials, so our understanding about the safety and efficacy of many well-established endovascular devices is limited. In addition, we have little data on long-term outcomes following use of newer technologies (eg, intravascular lithotripsy) in this patient subset.

Prof. Varcoe: What characteristics of an individual patient are useful to help you decide between endovascular therapies and open bypass surgery for the first revascularization of a TASC D femoropopliteal lesion?

Dr. Steiner: Most patients are referred to us for endovascular therapy, and we pursue an endovascular-first strategy in the majority of patients, including those with TASC D femoropopliteal lesions. However, all patients presenting with TASC D lesions are informed about alternative options, including open bypass surgery or prognosis without revascularization. In the absence of contemporary head-to-head comparisons between open surgery and endovascular techniques, physicians and patients have to make a joint decision on the preferred treatment strategy, weighing the perioperative risk against a possibly higher secondary reintervention rate after endovascular revascularization. In younger patients with premature advanced peripheral artery disease, an extensive workup should be performed before any revascularization, as rare causes for advanced lesions including lipid disorders or even occlusions based on popliteal entrapment syndrome have to be ruled out. If such conditions are overseen or left untreated, the prognosis of revascularization is poor.

Dr. Aronow: For most patients, there is clinical equipoise over whether open surgery or endovascular therapy is "best." Despite that, most patients in the United States undergo an endovascular-first strategy, even for TASC D femoropopliteal lesions, and my practice is in line with that approach. Having said that, comorbidities, specific anatomic findings (extent of popliteal and/or common femoral artery involvement), adequacy of available venous conduit, likelihood of "burning a surgical bridge" should surgery be necessary at a later date, and patient preference all should factor into decisions between endovascular and open surgical therapies for the first revascularization of a TASC D femoropopliteal lesion.

Dr. Schneider: More often than not, endovascular revascularization is my primary approach for the first revascularization for a TASC D femoropopliteal lesion. That being said, each patient has to be individually assessed for a "patient-first" approach. Patient factors such as symptoms (claudication vs CLTI), functional status, comorbidities, age, and longevity have to be considered, as well as the anatomic distribution of the arterial lesion(s), characteristics of the femoropopliteal lesion (occluded or calcified),

runoff, and availability of autologous vein conduit. Factors that might favor open bypass surgery or a hybrid approach are a younger, fit patient with a good single segment of saphenous vein, especially if the lesion is a flush superficial femoral artery (SFA) occlusion or if the patient also has significant common femoral artery disease.

Prof. Varcoe: How does lesion location (SFA vs popliteal artery) affect decision-making in TASC D femoropopliteal lesions?

Dr. Aronow: The threshold for intervening on isolated SFA lesions is obviously much lower, but all popliteal artery lesions are not created equal, and there are many patients with popliteal disease in whom an endovascular approach remains appropriate. This is especially true when the lesion involves P1 and/or P2 only; in that setting, I believe that the use of a nitinol-woven stent with drug-eluting balloon angioplasty fares best.

Dr. Schneider: Involvement of the popliteal artery, especially the P3 segment or the trifurcation, definitely affects my decision-making. Patients with these lesions have been excluded from most endovascular device trials and, in my experience, the outcomes of endovascular therapy for lesions involving the distal popliteal artery are not as good as for TASC D lesions involving the SFA and above-knee popliteal artery. Open bypass surgery for distal popliteal disease also typically requires a distal anastomosis to a tibial artery rather than the popliteal artery. For these reasons, we're often more conservative and recommend intervention, either endovascular or surgical, only for patients with CLTI and not for claudication.

Dr. Steiner: Long occlusions involving the femoral and popliteal artery to the P3 segment can be very challenging for endovascular treatment, and bypass surgery might be a good alternative. However, in many patients with such complex disease, distal runoff is often poor and no optimal bypass landing zone can be identified, hampering open surgery. In such cases, an individual decision has to be made based on clinical symptoms, the patient's perioperative risk, life expectancy, and the availability of sufficient autologous vein material. In general, a stent-avoiding strategy based on careful lesion preparation, drug-coated balloon (DCB) angioplasty, and provisional stent implantation is pursued in many patients, but even more so in the case of lesions with popliteal involvement. If stenting is necessary in the popliteal segment, prior cohort studies support the use of the interwoven Supera stent (Abbott), which is designed to withstand the torsional and compressive forces in the femoropopliteal vascular bed due to its high resistive radial strength.

Prof. Varcoe: What type of clinical trial endpoints and what duration of follow-up would most convince you to use an endovascular technique/technology in these advanced patterns of disease?

Dr. Schneider: Primary patency is better than freedom from target lesion revascularization, and ideally, we should have follow-up data for 3 or more years. Amputation-free survival is also a critical endpoint for CLTI patients, and we need to pay more attention to patient-centered outcomes such as quality of life (QOL), walking improvement, and independence.

Dr. Steiner: For clinical trials in the field of advanced femoropopliteal disease, I thinks it's important to follow primary patency for at least 2 years but to monitor freedom from target lesion revascularization, major amputations, overall survival, relief of symptoms, and QOL up to 5 years. When we treat very complex long lesions ≥ 30 cm, late restenosis might indicate progression of underlying advanced atherosclerotic disease rather than a failure of the initial intervention, but we have to ensure that one treatment strategy is not associated with a worse outcome compared to another with respect to clinical symptoms, amputations, and survival.

Dr. Aronow: In the setting of CLTI, long-term amputation-free survival, short-term wound healing, and pain resolution are important. For patients with claudication, long-term functional status and QOL should rule the day. While patency is no doubt important and objective, I prefer the previously noted patient-reported outcomes, as I believe that patients are most concerned with how they feel. It's why we do what we do.

Prof. Varcoe: Which new therapies hold the most promise in TASC C and D disease? How has their evolving data affected your decision-making, if at all?

Dr. Steiner: Recently, positive data have been published on tackling severe calcification, which is a major obstacle to successful endovascular interventions in complex lesions. In the VIVA REALITY study, plaque excision with directional atherectomy and subsequent DCB angioplasty was found to be effective with a low provisional stent rate at 12 months.[1] Intravascular lithothripsy showed improved procedural success compared to standard angiogplasty for moderate or severe calcification in a femoropopliteal artery prior to DCB or stenting.[2]

In clinical practice, I see good results with rotational atherectomy devices, as they can be very helpful for removal of superficial calcium to increase lumen dimensions. For extremely calcified lesions, which are often considered

"undilatable," the pave-and-crack technology is a real option with a high technical success rate and durable results. First, the lesion must be prelined with a covered stent to protect the vessel from rupture and facilitate an aggressive predilatation before relining it with a Supera stent.

Due to the high risk of restenosis, I prefer to use paclitaxel-eluting technologies for TASC C and D lesions. Importantly, a sustained treatment benefit has been demonstrated with paclitaxel-coated balloons and stents in long/complex lesion subsets. It will be interesting to see if limus-coated devices will represent an efficacious alternative to paclitaxel, but it will take some time before we get comparative efficacy data for complex lesions.

Dr. Schneider: DCBs and drug-eluting stents (DESs) have a clear role in the treatment of complex femoropopliteal disease, as well as woven nitinol and covered stents. Meticulous vessel preparation or plaque modification with lithoplasty or atherectomy are promising, but there are very little data to guide use in TASC C and D disease for these adjuncts. Especially for treatment of complex lesions that need scaffolding, data have shown that covered stents, woven stents, and DESs can achieve excellent results.

Dr. Aronow: I still prefer a basic wire and microcatheter to start most chronic occlusion cases, whether from an antegrade or retrograde approach. Crossing and reentry devices have their place and can get an operator out of a jam, but their use can often be relegated to second-line. Newer calcium management strategies, such as intravascular lithotripsy, may facilitate initial procedural success in patients with TASC C and D lesions; however, long-term data in these lesion subsets are needed. DCBs and DESs have increased the likelihood of long-term patency after initially successful endovascular procedures, although more data are needed in the setting of TASC C and D disease.

Prof. Varcoe: Does your real-world experience in extensive femoropopliteal disease correspond to what we've seen in trial settings?

Dr. Schneider: Not really, because many studies specifically exclude patients that we routinely treat in our clinical practices. Very long lesions (> 20 cm) and extensively calcified lesions are common but are not included in most device trials. Lesions involving the common femoral bifurcation or distal popliteal artery and trifurcation are specifically excluded from most device trials but are common problems in the "real world."

Dr. Steiner: In routine clinical practice, I see a more heterogeneous patient population including patients with CLTI and multilevel disease, (sub)acute reocclusions after prior revascularization, or patients after failed bypass surgery referred for endovascular therapy. In contrast, most studies for advanced femoropopliteal disease included a relatively homogenous group of claudicants with at least one patent runoff vessel.

Dr. Aronow: By design, many randomized controlled trials do not enroll real-world patients. They offer proof of concept and measure efficacy and safety for new devices. That said, single-arm trials and registries more often include real-world cohorts. For those reasons, my real-world experience is more in line with the registry data than with randomized controlled trials.

Prof. Varcoe: What is your preferred access and approach to advanced SFA disease cases? When do you change course and go with another approach (eg, retrograde)?

Dr. Aronow: I almost always approach cases from an antegrade approach initially. Failing that, approaching these lesions from a retrograde or alternative access site is worthwhile. The threshold for switching to another access site should be low and the decision to do so should occur early on, before much time has elapsed.

Dr. Steiner: In the majority of patients, I use a contralateral crossover approach using a 6- or 7-F braided sheath. In chronic total occlusions when an intraluminal guidewire passage is not possible, distal reentry can be challenging after subintimal guidewire passage. Here it is important to avoid guidewire dissection into the patent artery distal to the occlusion, so I have a low threshold to change to retrograde or use a reentry device to minimize the risk. After guidewire passage, predilatation helps to determine subsequent treatment, including potential lesion preparation and choosing a stent-based or stent-avoiding strategy with different drug-eluting technologies.

Dr. Schneider: My preferred access for complex SFA disease is an antegrade approach from the contralateral femoral artery. Most SFA lesions can be crossed from an antegrade approach, especially if reentry device(s) are available for difficult cases. However, it is also important to have experience with alternative access (retrograde tibial or popliteal or direct SFA puncture) for selected complex cases. Retrograde access is very useful for difficult SFA cases when it is important to stay intraluminal or when antegrade access has failed. Direct SFA puncture is also very useful for retrograde access to the lumen of chronically occluded SFA stents. ■

1. Rocha-Singh KJ, Sachar R, DeRubertis BG, et al. Directional atherectomy before paclitaxel coated balloon angioplasty in complex femoropopliteal disease: the VIVA REALITY study. Catheter Cardiovasc Interv. Published online June 3, 2021. doi: 10.1002/ccd.29777
2. Tepe G, Brodmann M, Werner M, et al. Intravascular lithotripsy for peripheral artery calcification: 30-day outcomes from the randomized disrupt PAD III trial. J Am Coll Cardiol Interv. 2021:14;1352-1361.