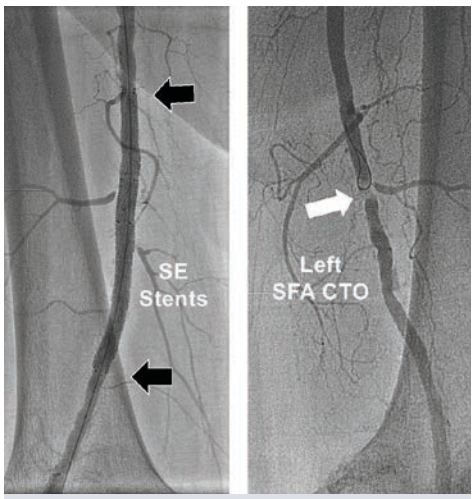
Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist



PERIPHERAL INTERVENTION

Radial to Peripheral in Women With Small Radial Arteries: 5 French Access for Endovascular Therapy in Femoral, Iliac, Renal, Subclavian and Carotid Artery Disease

Robert L. Minor, Jr, MD

Transradial access (TRA) with same-day discharge for coronary interventions can save over $3000 per case, as compared to femoral access with overnight hospital stay. In addition, it improves safety, reduces patient discomfort, and is strongly preferred by patients and nursing staff. TRA for endovascular interventions also allows same-day discharge and may provide similar benefits.[1]

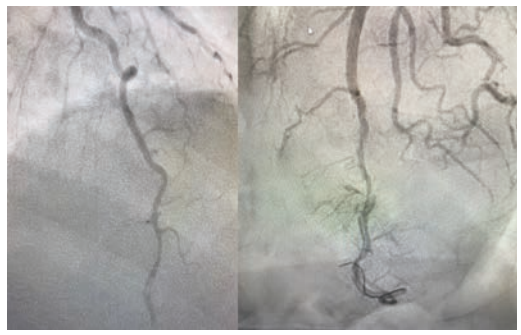
continued on page 16

In This Issue

CARDIOLOGY CARE

Coronary Artery Disease in Women: A Review

Julie Billingsley, Richard J. Merschen, EdS, RT(R)(CV), RCIS



Cardiovascular disease (CVD) is the leading cause of death in women and men in the United States. Coronary artery disease (CAD), heart failure, and stroke cause around 500,000 deaths in U.S. women every year, with the most deaths caused by CAD.[1] While CAD is the leading cause of death in both sexes, the etiology, recognition, management, and outcomes of CAD differ between men and women. Many of the common risk factors associated with CAD also have different clinical presentations and chronology in women. Additionally, women may have pregnancy-, ovarian-, and estrogen-related complications that increase their risk for developing CAD.[2]

continued on page 10

OUT-OF-HOSPITAL CARE

How One Healthcare System Creates and Partners Around Cardiovascular Ambulatory Surgical Centers

CLD talks with Kristi McShay, Associate Vice President, Cardiovascular Service Line, Banner Health.

Can you tell us about your role and how you are involved with cardiovascular ambulatory surgical centers (ASCs)?

I am the associate vice president for cardiovascular services at Banner Health, and in our organization, it is a corporate-level position. I report up through the vp of service lines to our chief strategy officer. Banner Health's service line executives are very firmly housed within the strategy side of the organization versus operations, meaning I am not "in the weeds" as an operational person.

continued on page 14

Continued from cover

Radial to Peripheral in Women With Small Radial Arteries: 5 French Access for Endovascular Therapy in Femoral, Iliac, Renal, Subclavian and Carotid Artery Disease

Robert L. Minor, Jr, MD

Radial to peripheral guide sheaths in 6 French (Fr) and 7 Fr with 150 cm lengths are available, and 6 Fr-compatible peripheral balloons and stents on longer delivery catheters up to 200 cm in length now allow radial access to reach iliac and superficial femoral artery (SFA) disease. Taller patients, and those with tortuous subclavian arteries and aortas, present challenges in reaching lower-extremity disease with TRA, given the increase in distance from radial access to target lesions. Use of left TRA offers a benefit over right TRA, by allowing additional purchase of up to 8 cm further into the aorta and lower extremity circulation.

Small radial artery size <2.0 mm seen on ultrasound imaging of the wrist, found in many women, has been a barrier to using 6 Fr TRA. Endovascular cases in women with small radial arteries are presented using the limited number of 5 Fr-compatible device technologies currently available in the U.S., including a new drug-coated balloon (DCB) technology. Tips and tricks are discussed for addressing the technical challenges of these 5 Fr TRA endovascular procedures for treating femoral, iliac, renal, subclavian and carotid artery disease.

Case #1

A 68-year-old Native American female (5 feet 2 inches, 157 cm in height) with disabling left calf claudication and resting left ankle-brachial index (ABI) of 0.68 was referred for consideration of endovascular therapy. Diagnostic angiography using 5 Fr left TRA revealed severe left SFA disease with a lesion length of 25 cm, including 90% proximal SFA stenosis, with 3-vessel tibial runoff (Figure 1). A 300 cm .035-inch Wholey guidewire (Medtronic) was used to direct a 120 cm .035-inch 5 Fr Sublime guide sheath (Surmodics) into the left common femoral artery. Using this guide sheath, a 150 cm .035-inch 4.3 Fr TrailBlazer support catheter (Medtronic) was advanced over the Wholey guidewire across the SFA disease into the distal popliteal artery. A 320 cm .014-inch SpiderFX 6 mm capture wire (Medtronic) was deployed in the popliteal artery for embolic protection. Intervention was performed using two overlapping 6 mm x 150 mm 018 IN.PACT DCBs on 200-cm long catheters (Medtronic). After filter retrieval using the TrailBlazer catheter, filter inspection showed capture of embolic debris. Final angiography showed <30% residual SFA stenosis and no evidence for distal embolization. A TR Band (Terumo) achieved radial access hemostasis, with hospital discharge two hours later. At 9-month follow-up, the patient had no recurrent left leg claudication.

Endovascular cases in women with small radial arteries are presented using the limited number of 5 Fr-compatible device technologies currently available in the U.S., including a new drug-coated balloon (DCB) technology.

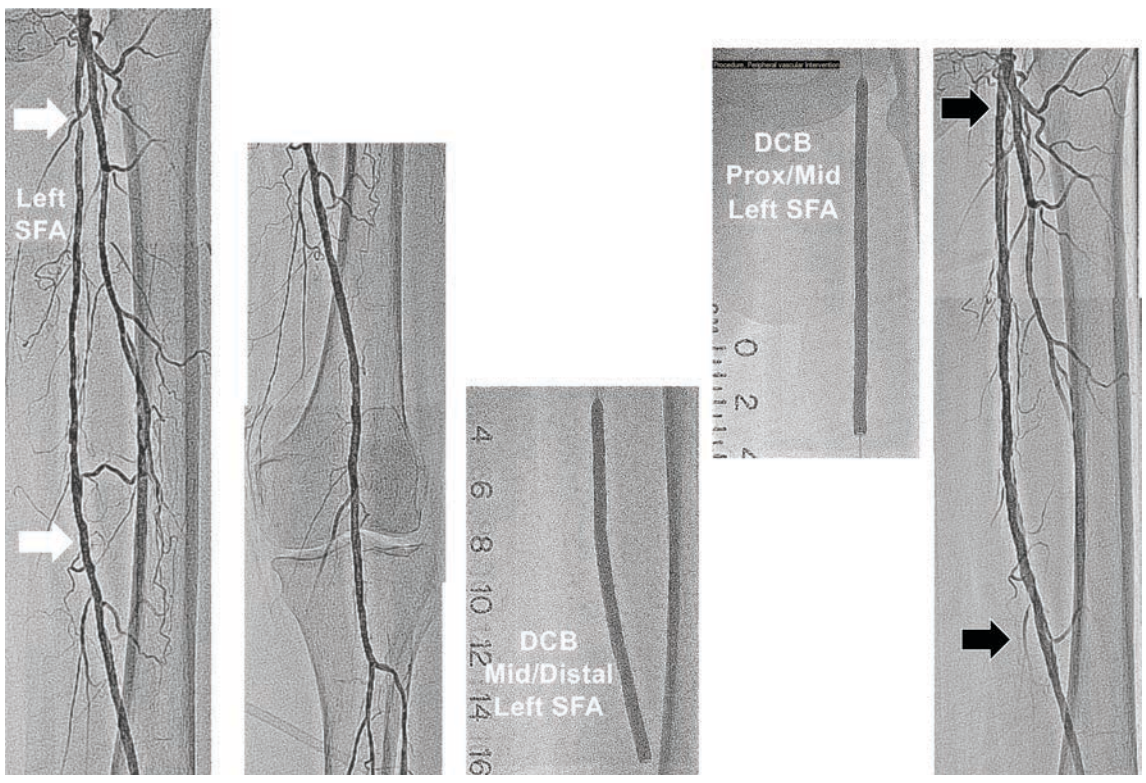


Figure 1. Long segment disease in left superficial femoral artery (SFA) with 3-vessel tibial runoff. Treatment with overlapping 018 IN.PACT drug-coated balloons (DCBs) (Medtronic) over a SpiderFX capture wire (Medtronic), with final angiogram; 5 French (Fr) left transradial access (TRA).

Tips and Tricks for 5 Fr DCB therapy in the SFA

Use of the 320 cm .014-inch SpiderFX capture wire is extremely helpful with 5 Fr TRA for therapy with the new 018 IN.PACT DCB in the SFA, where it serves a dual purpose. First, embolic protection is provided. Second, the deployed 6 mm filter helps maintain wire position in the SFA during catheter exchanges. As the 320 cm wire length is not long enough for over-the-wire 200 cm DCB catheter exchanges, the wire cannot be secured during the duration of DCB advancement or withdrawal, raising concerns about inadvertent proximal or distal displacement of the filter. By slowly advancing the DCB catheter through the 5 Fr guide sheath during fluoroscopic visualization of the filter in the SFA, maintenance of stable filter position can be confirmed, until the back end of the wire is secured. After treatment is completed, the DCB catheter can be slowly removed over the filter wire until the back of the wire withdraws into the back hub of the catheter. At this point, a saline-filled 10 cc syringe can be connected to the back hub of the DCB catheter. Continuous and firm hand injection of saline into the lumen of the DCB

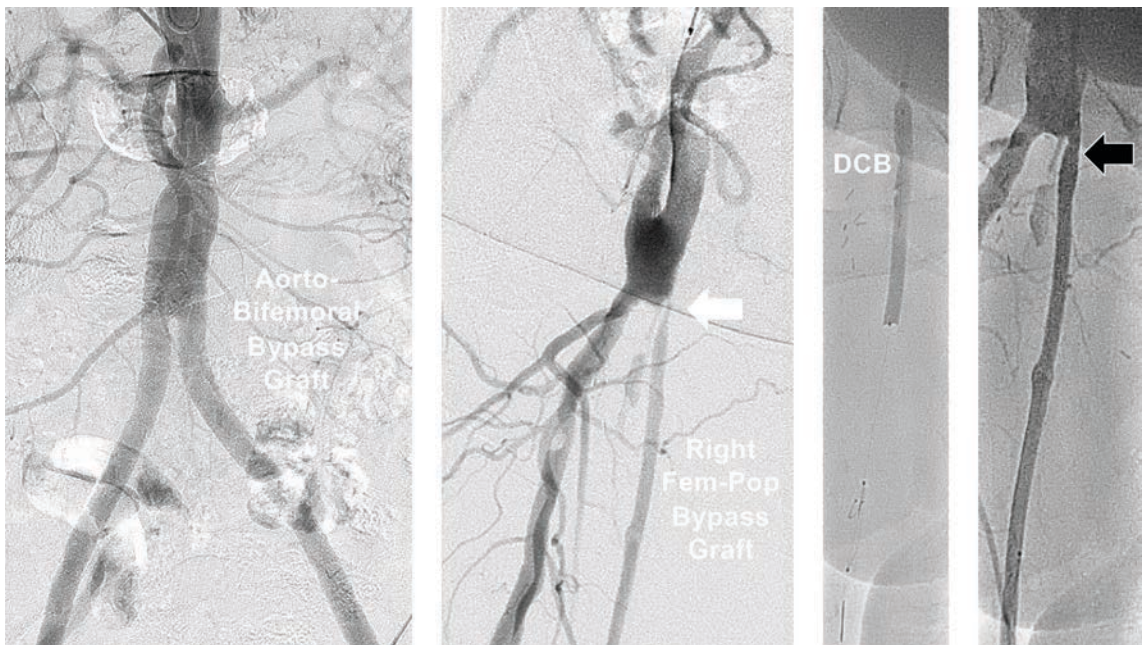


Figure 2. Abdominal aortogram demonstrating normal aorto-bifemoral bypass graft, with selective femoral angiogram confirming critical proximal anastomotic disease in the right fem-pop bypass. Treatment used 018 IN.PACT DCB over a SpiderFX capture wire, and subsequent angiogram with filter present; 5 Fr right TRA.

catheter containing the filter wire will allow slow withdrawal of the catheter from the guide sheath, while fluoroscopy confirms stable filter position in the SFA. This technique was first described by Nanto et al in 1994,[2] and more recently referred to as the "guidewire hydro-glide technique".[3] Similarly, slow advancement of the TrailBlazer catheter until the back of the filter wire is secured will maintain a stable wire position in the SFA prior to filter retrieval. As the Trailblazer support catheter is translucent, the guidewire can be easily visualized through the shaft of the catheter during catheter advancement, until it can be secured as it exits the back of the catheter.

Case #2

A 66-year-old female (5 feet 4 inches, 163 cm in height) developed debilitating right leg claudication with right leg ABI of 0.44 and left leg ABI of 1.0. She had previously undergone multiple vascular surgical bypass procedures. These included aorto-bifemoral bypass, left femoral-tibial bypass, and recent right femoral-popliteal (fem-pop) bypass using autologous vein. Computed tomography (CT) angiography confirmed patency of her lower extremity bypasses, with severe stenosis of the proximal anastomosis of the right fem-pop graft, and calcified popliteal artery-P2 segment disease beyond the distal graft anastomosis, with 3-vessel tibial runoff. Both groins were heavily scarred, and her surgical team declined further vascular surgery.

Diagnostic angiography was performed using 5 Fr right TRA, via a 150 cm TrailBlazer catheter advanced through the right limb of the aorto- bifemoral graft to the right common femoral artery. Imaging confirmed a 99% proximal anastomotic lesion of the fem-pop vein graft (Figure 2). Using a 300 cm Wholey guidewire directed into the right profunda femoral artery, a 110 cm 5 Fr Flexor Shuttle sheath (Cook Medical) was advanced to the common femoral artery. A 300 cm .014-inch coronary guidewire was used to cross the vein graft stenosis, and intravascular ultrasound study of the fem-pop graft (IVUS, OptiCross 6 HD 60 MHz, 135 cm catheter, Boston Scientific) demonstrated a severe concentric fibrous lesion, with a graft diameter of 4.8 mm. A TrailBlazer catheter was advanced into the mid segment of the fem-pop graft, allowing exchange for a 320 cm SpiderFX 6 mm capture wire. Percutaneous transluminal angioplasty (PTA) with a monorail rapid exchange (RX) Wolverine 4 mm x 12 mm coronary cutting balloon on a 143 cm catheter (Boston Scientific) was followed by treatment with 018 IN.PACT 5 mm x 60 mm DCB on a 200-cm long catheter. After filter retrieval using the TrailBlazer catheter, angiography revealed <30% residual stenosis. Use of a TR Band allowed immediate ambulation, with discharge to home two hours later. Through a staged outpatient procedure, she underwent right pedal access for successful intravascular lithotripsy therapy (Shockwave Medical) in her distal right popliteal artery disease. Long-term fem-pop graft surveillance using serial arterial duplex study was planned.

Tips and Tricks for 5 Fr DCB therapy in a Fem-Pop Bypass

Using right 5 Fr TRA, the 018 IN.PACT DCB on a 200-cm long catheter easily reached through the right-sided limb of the aorto-bifemoral bypass to treat the ostial fem-pop graft stenosis. IVUS provided accurate analysis of the disease composition and graft diameter, for guiding device selection and balloon sizing. The "guidewire hydro-glide technique" allowed DCB catheter use without migration of the filter wire.

(***continued online***)

Continue with cases #3-8 online. Scan the QR code to be taken directly to the article:

Use of the 320 cm .014-inch SpiderFX capture wire is extremely helpful with 5 French transradial access for therapy with the new 018 IN.PACT DCB in the superficial femoral artery (SFA), where it serves a dual purpose. First, embolic protection is provided. Second, the deployed 6 mm filter helps maintain wire position in the SFA during catheter exchanges.

Robert L. Minor, Jr, MD
Interventional Cardiologist and Endovascular Specialist;
Director of Endovascular Interventions, Limb Preservation Program,
Billings Clinic Heart and Vascular at Community Medical Center, Missoula, Montana

Disclosure: Dr. Minor reports serving as a consultant for Medtronic and Surmodics.

Robert L. Minor, Jr, MD can be contacted at rminor@communitymed.org.

ONLINE ONLY

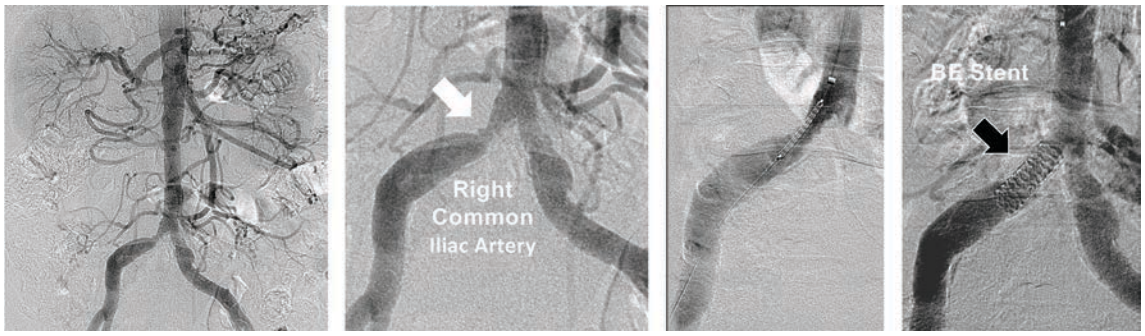


Figure 3A. Abdominal aortogram with right common iliac artery stenosis. Stent positioning across the iliac lesion, with final angiogram after Herculink Elite RX balloon-expandable (BE) stenting (Abbott); 5 Fr right TRA.

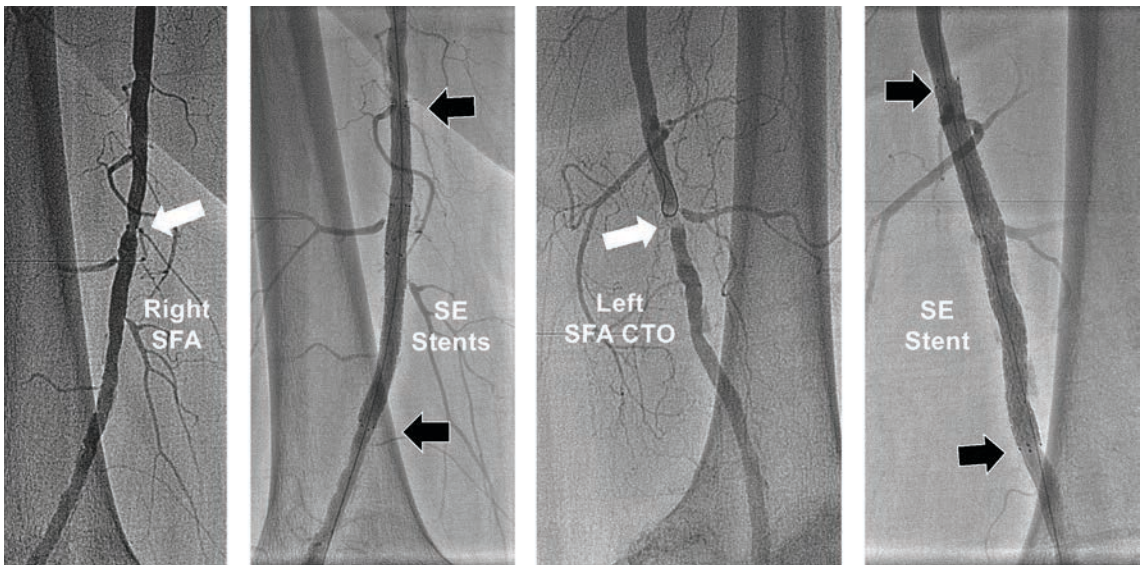


Figure 3B. Right SFA disease and left SFA chronic total occlusion (CTO). Before and following treatment with bilateral SFA EverFlex Entrust self-expanding (SE) stents (Medtronic); 5 Fr right TRA.

Case #3

A 78-year-old short and obese Hispanic female (4 feet 10 inches, 147 centimeters in height, weight 200 pounds/90.7 kg) was referred with severe bilateral leg claudication, with critical limb ischemia due to a non-healing left foot wound. Using 5 Fr right TRA, abdominal aortography identified a right common iliac stenosis (Figure 3A). A 150 cm TrailBlazer catheter was advanced over a 300 cm Wholey guidewire into both common femoral arteries, and angiography revealed a short chronic total occlusion (CTO) of the left SFA, significant right SFA disease (Figure 3B), with 2-vessel tibial runoff into intact pedal arches bilaterally. The TrailBlazer catheter was further advanced over the Wholey guidewire to a level just above each SFA lesion, to confirm that the distance from right TRA to target lesions did not exceed 150 cm, the length of the device technology catheters being considered for therapy. In the right leg, following injection of 500 mcg of nitroglycerin through the TrailBlazer catheter, a significant 60 mmHg trans-stenotic pressure gradient was measured across the right iliac artery stenosis.

Using the Wholey guidewire, a 90 cm 5 Fr Flexor Shuttle sheath was first advanced into the left external iliac artery. The TrailBlazer catheter was positioned immediately above the left SFA CTO, and connected to a manifold using a Tuohy-Borst adapter (Cook Medical). This allowed injections of 2-4 cc of contrast for facilitating chronic total occlusion (CTO) crossing with a .014-inch 300 cm long Grand Slam (Abbott Vascular) coronary guidewire. Treatment was performed with an .018-inch Armada PTA balloon 6 mm x 60 mm on a 150 cm catheter (Abbott). A 5 Fr-compatible .035-inch EverFlex with Entrust delivery system self-expanding (SE) 7 mm x 80 mm stent on a 150 cm catheter (Medtronic) was deployed in the left SFA, then post-dilated with the Armada 6 mm x 60 mm balloon (Figure 3B). The Flexor Shuttle sheath was redirected using the Wholey guidewire into the right external iliac artery, with exchange for the .014-inch 300 cm guidewire. The right SFA was treated with overlapping EverFlex Entrust SE stents measuring 6 mm x 60 mm and 6 mm x 40 mm, with post-dilatation using an Armada 5 mm x 60 mm balloon (Figure 3B). Pre-dilation of the right common iliac artery stenosis was performed with a .014-inch Viatrac 14 Plus RX 7 mm x 15 mm PTA balloon (Abbott), followed by a .014-inch Herculink Elite RX 7 mm x 18 mm balloon-expandable (BE) stent (Abbott), both on 135 cm monorail catheters (Figure 3A). The patient was discharged 3 hours later following use of a TR Band. Her left foot wound healed within one month, her claudication resolved, and ABIs remained normal at two-year follow-up.

Tips and Tricks for 5 Fr Stenting in the SFA and Iliac Artery

This case predated the availability of the 018 IN.PACT DCB on a 200-cm long catheter. The 150 cm Trailblazer catheter has three marker bands embedded in the distal end, spaced apart by 50 mm. This catheter was used to measure the "intravascular distance" from the hub of the radial access sheath to the SFA target lesions, and verified that PTA balloons and the EverFlex Entrust SE stents on 150 cm catheters could reach the SFA disease. By using a Tuohy-Borst adapter, the TrailBlazer support catheter was converted to a "mini guide" catheter, allowing contrast injections of 2-4 cc to facilitate crossing the left SFA CTO and right SFA disease with an .014-inch guidewire. The Viatrac 14 RX PTA balloon and the Herculink Elite RX BE stent allowed single operator guidewire control for catheter advancement and retrieval from the common iliac artery. The Viatrac and Herculink RX device technologies are both currently available in up to 7 mm diameters for 5 Fr sheath size. At present, treatment with PTA and BE stents in 8 mm diameters or greater requires exchange for a 6 Fr radial access sheath to accommodate the larger diameter over-the-wire catheters.

Case #4

A 72-year-old Asian female (5 feet, 152 cm in height) with debilitating left greater than right buttock and thigh claudication was found to have resting ABIs falling with exercise from 0.80 down to 0.65 in the right leg, and 0.68 down to 0.40 in the left leg. Diagnostic angiography using 5 Fr right TRA demonstrated severe bilateral common and external iliac artery disease, and internal iliac artery occlusions (Figure 4), with no significant infrainguinal vascular disease. A 300 cm Wholey guidewire was used to direct a 110 cm 5 Fr Flexor Shuttle sheath into the distal abdominal aorta, with advancement of a 300 cm coronary guidewire across each iliac artery. Pre-dilatation was performed in both iliacs using a Viatrac 14 Plus RX 7 mm x 15 mm PTA balloon. Subsequently, two overlapping EverFlex Entrust 8 mm x 80 mm SE stents were deployed in each iliac artery to treat the diffuse disease. Post deployment was performed with the Viatrac 14 Plus RX balloon. The patient was discharged 3 hours later following use of a TR Band.

Tips and Tricks for 5 Fr Bilateral Iliac Artery Stenting

5 Fr TRA for iliac artery stenting can be accomplished in most women with peripheral Herculink Elite RX BE stents up to 7 mm in diameter and 18 mm in length, and EverFlex Entrust SE stents up to 8 mm in diameter and 150 mm in length. Primary therapy for bilateral aortoiliac ostial disease in women with small radial arteries can be performed using bilateral radial access and .014-inch guidewires. Advancement of two 5 Fr Sublime 120 cm guide sheaths into the terminal abdominal aorta will facilitate

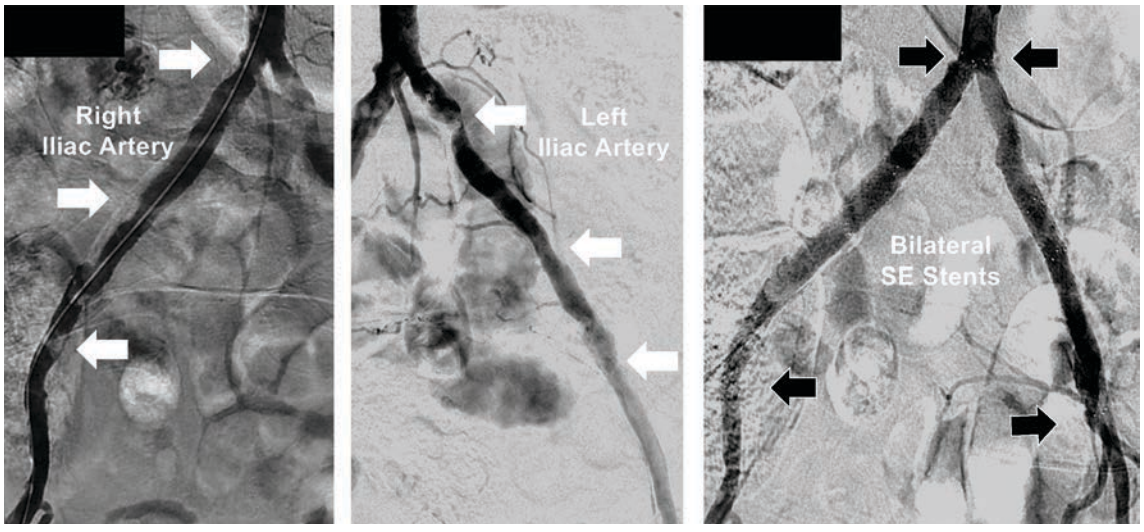


Figure 4. Diffuse bilateral common and external iliac artery disease. Following bilateral iliac artery stenting with EverFlex Entrust SE stents; 5 Fr right TRA.

Figure 5. Aortogram demonstrating calcified eccentric disease of left external iliac artery, below remotely implanted "kissing" iliac stents extending into the abdominal aorta. Selective imaging before and after treatment with overlapping Herculink Elite RX BE stents, with final aortogram; 5 Fr left TRA.

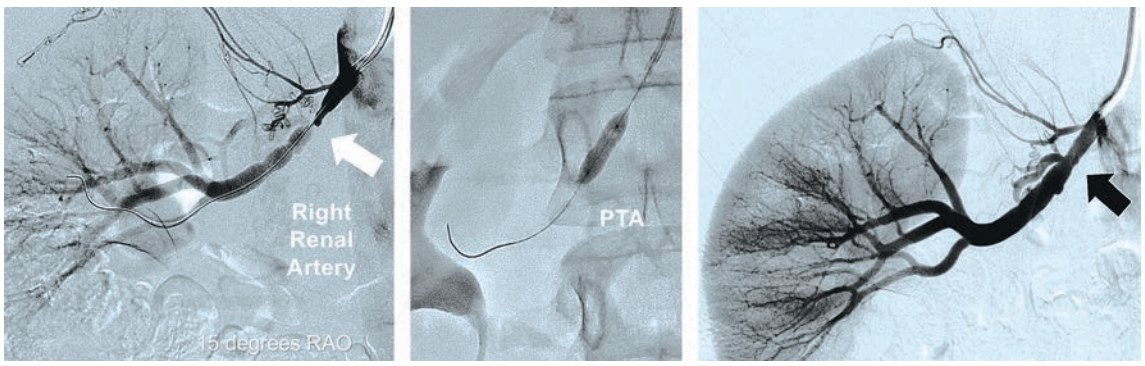


Figure 6. Right renal artery fibromuscular dysplasia. Percutaneous transluminal angioplasty (PTA) treatment, with final angiogram; 5 Fr right TRA.

RAO = right anterior oblique

pre-dilatation with "kissing balloons" using two Viatrac 14 plus RX PTA balloons, followed by two Herculink Elite RX BE "kissing stents" up to 7 mm in diameter. Endovascular therapy for short iliac artery CTOs has been accomplished using 5 Fr TRA. However, most operators may prefer 6 Fr or 7 Fr femoral artery access for treating women with iliac CTOs, so that the rare complication of iliac artery perforation can be immediately treated using stent-graft implantation with a Viabahn endoprosthesis (Gore). Lower profile .018-inch Viabahn delivery catheters currently require 6 Fr for 6 mm devices, and 7 Fr for 7 mm and 8 mm devices, and are available only in 120 cm catheter lengths.

Case #5

A 75-year-old female (5 feet 10 inches, 178 cm in height) had undergone remote bilateral "kissing" iliac stents extended into the aorta using bilateral femoral artery access, complicated by access site hemorrhage requiring blood transfusions and prolonged hospital stay. She presented with recurrent and debilitating left leg claudication. Resting ABI in the right leg was 0.94, unchanged with exercise. In the left leg, her ABI fell from 0.64 at rest to 0.48 with exercise. She refused to consider repeat femoral artery access for angiography or intervention. Diagnostic angiography performed using 5 Fr left TRA demonstrated patent common iliac artery stents, with a new heavily calcified and eccentric left external iliac artery stenosis (Figure 5). A 150 cm Trailblazer catheter was used to direct a 300 cm Wholey guidewire through the left iliac artery stent, across the lesion and into the SFA. This catheter was exchanged for a 110 cm Flexor Shuttle sheath advanced beyond the proximal edge of left common iliac artery stent. Over a 300 cm .014-inch coronary guidewire, the external iliac disease was treated with a Viatrac 14 Plus RX 5 mm x 15 mm balloon, with severe lesion recoil. Two overlapping Herculink Elite RX 7 mm x 18 mm BE stents were deployed, with excellent angiographic results. The patient was discharged 3 hours later following use of a TR Band.

Tips and Tricks for 5 Fr Stenting Through "Kissing" Iliac Stents

Left TRA allows additional purchase of up to 8 cm further into the lower extremity circulation than right TRA. Left TRA is preferred for reaching distal external iliac artery disease in taller patients, and in those with very tortuous aortoiliac anatomy, as both circumstances increase the intravascular distance needing to be traversed. In this patient, heavily calcified eccentric external iliac artery disease necessitated BE instead of SE stent technology, with stent delivery facilitated by first advancing the Flexor Shuttle sheath with its introducer through the left common iliac stent. Stored images obtained in higher magnification during PTA balloon inflation allowed appropriate sizing of the Herculink Elite RX BE stents to 7 mm.

Case #6

An 18-year-old female (5 feet 2 inches, 158 cm in height) with severe hypertension requiring 3-drug therapy was found on renal artery duplex ultrasound imaging to have a right renal artery to aortic velocity ratio = 6.0. Using 5 Fr right TRA, selective renal angiography was performed with a 90 cm 5 Fr JR4 Launcher guide catheter (Medtronic), confirming severe fibromuscular dysplasia of the right renal artery (Figure 6). The lesion was crossed with a 180 cm .014-inch coronary guidewire, and PTA was performed with a noncompliant 5 mm x 15 mm coronary RX monorail balloon. Following use of a TR Band, the patient was discharged two hours later. Her hypertension subsequently resolved off all blood pressure medications.

Tips and Tricks for 5 Fr Renal Artery Intervention

In very short patients, standard 5 Fr 90 cm long coronary guiding catheters allow reach to the renal

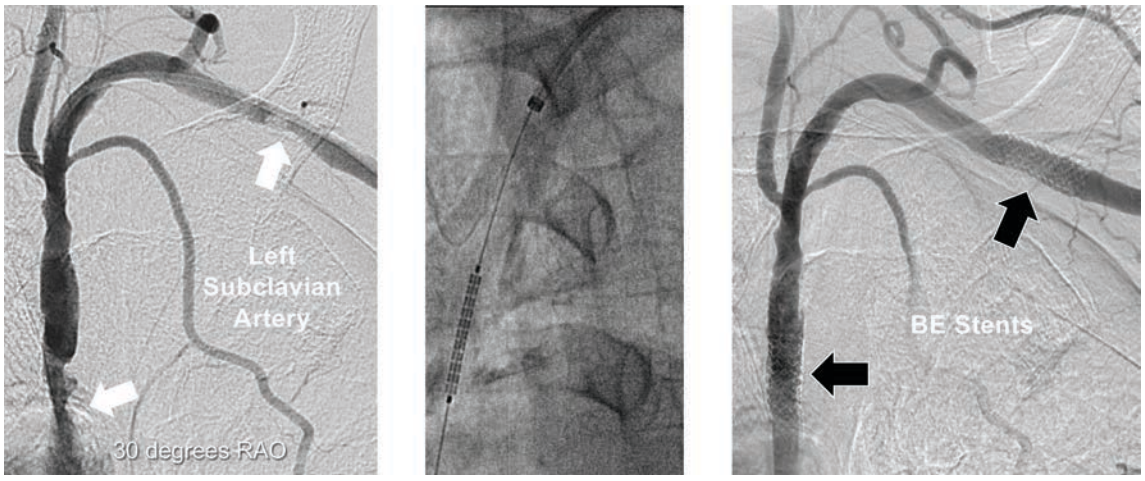


Figure 7.Left subclavian artery ostial and mid segment disease. Ostial stent positioning, with final angiogram after Herculink Elite RX BE stents, 5 Fr left TRA.

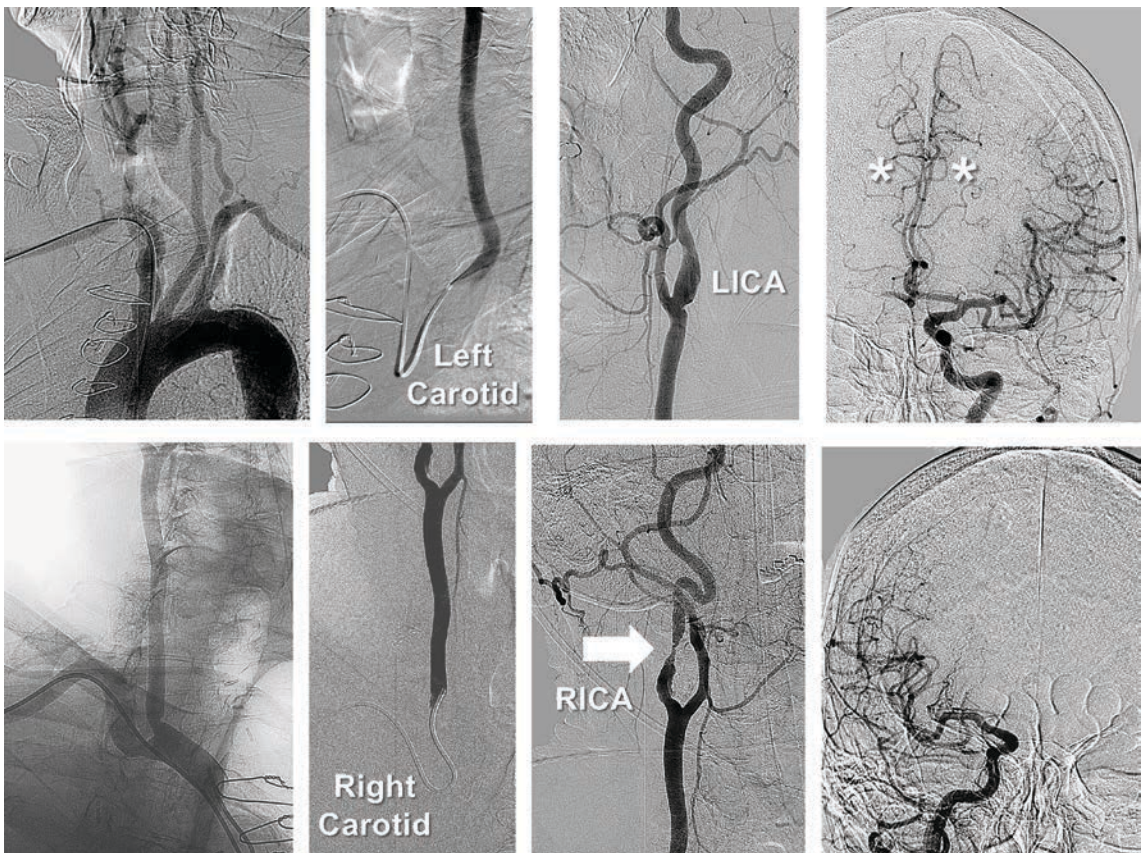


Figure 8A. Thoracic arch angiogram with selective bilateral carotid artery and intracerebral angiography using 5 Fr right TRA, with the left carotid circulation in upper panel, and the right carotid circulation in lower panel. This confirmed mild left internal carotid artery (LICA) and critical right internal carotid artery (RICA) disease. Prior to right carotid stenting, both left and right anterior cerebral arteries (*) fill from left carotid artery flow.

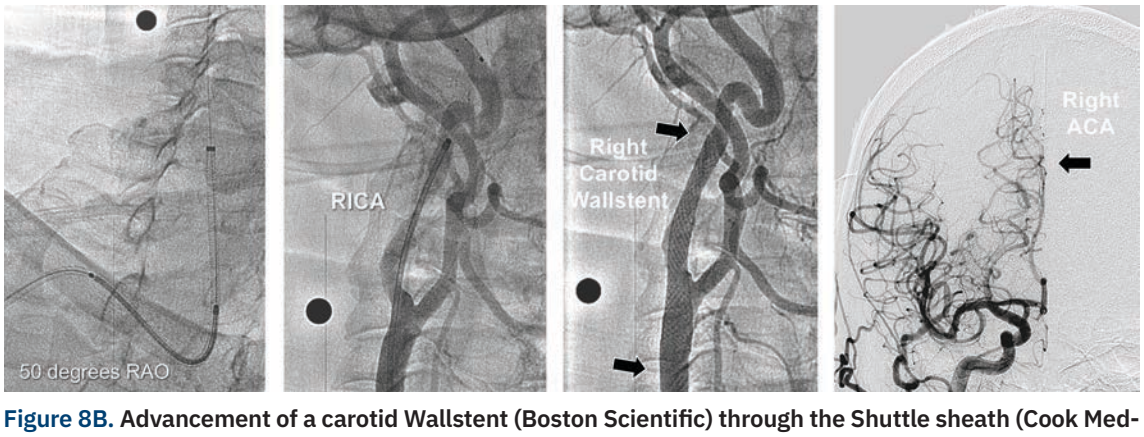


Figure 8B. Advancement of a carotid Wallstent (Boston Scientific) through the Shuttle sheath (Cook Medical), and positioning to cover RICA disease over a SpiderFX capture wire. Final angiograms after carotid stenting, with restoration of normal flow into the right anterior cerebral artery (ACA); 5 Fr right TRA.

arteries, celiac, and superior mesenteric arteries from right TRA for performing PTA with coronary balloons, or for using coronary stents up to 5 mm in diameter. At present, no larger BE peripheral stents are compatible with 5 Fr guiding catheters. In taller patients, left TRA allows further reach to the abdominal aortic visceral arteries by avoiding the need to traverse tortuosity in the right subclavian artery or steeply angulated type III thoracic aortic arches. The 5 Fr Launcher coronary guide catheters can be custom ordered in 110 cm lengths (MB1 and MB2 guide catheters, Medtronic) to reach renal and mesenteric arteries using left TRA in nearly all patients, regardless of height. The 5 Fr guide sheaths and 6 Fr guiding catheters can accommodate delivery of 6- and 7-mm diameter Herculink Elite RX BE stents available in 12, 15 and 18 mm lengths, sizes generally needed for atherosclerotic disease of the renal, superior mesenteric, and celiac arteries. However, cannulation of these vessels and intervention using 5 Fr guide sheaths is technically very challenging, with most operators preferring use of 6 Fr curved guiding catheters that provide excellent coaxial support at the ostium of the downward takeoff of these arteries.

Case #7

A 70-year-old female with severe left arm claudication and no palpable left arm pulses underwent angiography using 5 Fr left TRA (Figure 7). The 5 Fr access sheath was exchanged over an .035-inch 260 cm Wholey guidewire advanced to the aortic root for a 5 Fr 90 cm Flexor Shuttle sheath, with guidewire exchange for a 180 cm coronary .014-inch guidewire. The two left subclavian lesions were pre-dilated with a Viatrac 6 mm x 15 mm RX PTA balloon, followed by a Herculink Elite RX 7 mm x 18 mm BE stent at the ostium, and a Herculink Elite RX 7 mm x 15 mm BE stent in the mid segment. Use of a TR Band allowed hospital discharge in 3 hours. The patient had immediate and sustained relief of her arm claudication.

Tips and Tricks for 5 Fr Subclavian Artery Stenting

The patient had no palpable left radial pulse. Ultrasound guidance allowed recognition and sizing of her small radial artery, and facilitated initial access for sheath placement. Contrast injections via the 5 Fr guiding sheath allowed accurate deployment of the Herculink Elite RX BE stents in the ostium and mid segment of the left subclavian artery.

Case #8

A 72-year-old female with progressive asymptomatic >80% right carotid stenosis on carotid duplex ultrasound, status post right lung lobectomy with severe oxygen-dependent lung disease, was referred for carotid stenting. Using right 5 Fr TRA, a thoracic aortic arch angiogram was performed. A 5 Fr Simmons-1 glide catheter (Cook Medical) was directed into the left carotid artery for imaging of

left internal carotid and intracerebral circulation, revealing filling of both left and right anterior cerebral arteries (Figure 8A). The Simmons-1 catheter was redirected into the innominate artery, and then withdrawn in order to cannulate the right common carotid artery for imaging the right internal carotid artery stenosis, and intracerebral circulation. Prior to carotid stenting, the right anterior cerebral artery did not fill by right carotid artery flow.

With the Simmons-1 catheter "secured" into the proximal common carotid artery, an .035-inch 260 cm angled Glidewire (Terumo) was advanced into the right external carotid artery. The radial access sheath was exchanged for a 5 Fr 90 cm Flexor Shuttle sheath, which was advanced into the right common carotid artery, with removal of the Glidewire. A 180 cm .014-inch hydrophilic coronary guidewire was used to cross the right internal carotid lesion, with exchange for a SpiderFX 7 mm capture filter wire. A 6 mm diameter metallic sphere positioned on the patient's neck assisted in vessel sizing. Pre-dilatation was performed using an .014-inch Sterling Monorail RX 4 mm x 20 mm balloon on a 135 cm catheter (Boston Scientific). An. 014-inch carotid Wallstent 8 mm x 36 mm on a 135 cm monorail RX catheter (Boston Scientific) was deployed to cover the carotid lesion, positioned below the level of the acute bend in the right internal carotid artery. Postdilation was performed with a 5 mm x 20 mm Sterling RX balloon. Following filter retrieval, intracerebral angiography demonstrated restoration of antegrade flow into the right anterior cerebral artery (Figure 8B). After hemostasis with a TR Band, the patient ambulated immediately, and neurologic testing remained normal.

Tips and Tricks for 5 Fr Carotid Artery Stenting

Right carotid artery stenting using 5 Fr TRA may reduce the number of catheter manipulations required in diseased thoracic aortic arches as compared to femoral artery access. This could decrease risks for embolization during common carotid artery cannulation and guide sheath placement. The 5 Fr Shuttle sheath allowed excellent imaging when using the .014-inch monorail PTA balloons and .014-inch monorail Wallstent delivery system. For 5 Fr guide sheath delivery, carotid Wallstent technology is available in 6 and 8 cm diameters, with 21, 29, and 36 mm unconstrained lengths.

Conclusions

Patients of small stature are often found on ultrasound imaging of the wrist to have small radial arteries <2.0 mm that cannot accommodate endovascular device technologies requiring 6 Fr access sheaths. This includes many women, especially Native Americans and those of Hispanic and Asian descent. The use of 5 Fr TRA for endovascular therapy in patients with small radial arteries is possible, albeit with a limited selection of device technology currently available in the U.S. The new 5 Fr-compatible 018 IN.PACT DCB on a 200-cm long catheter allows radial to peripheral treatment for SFA and popliteal artery disease, facilitated by left radial access.

Most women with severe claudication due to stenotic disease in the iliac artery and SFA who are found to have small radial arteries should be considered for 5 Fr TRA for endovascular therapy. This proves particularly useful in women with aorto-bifemoral bypass grafts, bifurcating aortic stent grafts, bilateral iliac stents extending into the aorta, and obese or scarred groins. Endovascular therapy options for critical limb ischemia can also be expanded for women with small radial arteries, with the use of combined 5 Fr TRA and pedal access. Moreover, increased use of 5 Fr TRA in patients with small radial arteries may result in significant volume increases in endovascular procedures provided in outpatient-based laboratory settings. Potential benefits include increased safety with radial access, reduced costs, early ambulation, and routine same-day discharge.

Future 5 Fr technology needs for extending therapy into the distal SFA and popliteal artery will require the development of longer guidewires and filter wires exceeding 400-450 cm, with extension of device delivery catheter lengths beyond 250 cm. These innovations would reduce the technical challenges encountered in these procedures, and potentially allow 5 Fr TRA access to reach into the distal tibial artery circulation, thereby facilitating multilevel endovascular therapy. ■

References

1. Minor R, Maley T, Jenkins D. Transradial access for endovascular interventions with same-day discharge: feasibility and safety in a community hospital. *J Vasc Surg*. 2019 Nov; 70(5S): e179. https://doi.org/10.1016/j.jvs.2019.08.166
2. Nanto S, Ohara T, Shimonagata T, et al. A technique for changing a PTCA balloon catheter over a regular-length guidewire. *Cathet Cardiovasc Diagn*. 1994 Jul; 32(3): 274-277. doi: 10.1002/ccd.1810320317
3. Stys A, Khan M, Rajpurohit N, et al. Guidewire hydroglide technique 'booster.' *Cath Lab Digest*. 2014 July; 22(7): 37. https://www.hmpgloballearningnetwork.com/site/cathlab/articles/guidewire-hydroglide-technique-booster