Peripheral Vascular CTA

Expanding the role of PV-CTA in the overall management of PVD.

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In March 2004, we presented our early 16-slice computed tomography angiography (CTA) experience with the inaugural CTA article in *Endovascular Today*. That early CTA experience focused on novel diagnostic applications of CTA in patients with peripheral vascular disease (PVD). We stated then how revolutionary CTA was in our practice and that peripheral vascular (PV)-CTA had replaced traditional angiography. In this issue, we describe our clinical experience during the past 4 years, now with outpatient 64-slice PV-CTA, and how it has now revolutionized not only the diagnostic but also the comprehensive clinical management and treatment of PVD. PV-CTA has become just as an important as an endovascular or surgical tool in our "therapeutic PVD toolbox" as any drug, wire, catheter, balloon, stent, laser, atherectomy device, surgical bypass, etc. We provide multiple examples of the clinical benefits of PV-CTA and a series of illustrative images and cases describing how we have learned to use 64-slice CTA in our daily management of complex atherosclerotic nonaneurysm PVD.

VASCULAR ACCESS MANAGEMENT

The first and last step of any safe and successful peripheral vascular intervention (PVI) is the selection of a vascular access and a strategy for post-PVI vascular access management (VAM). Vascular access complications (VACs) after percutaneous coronary interventions (PCI) remain

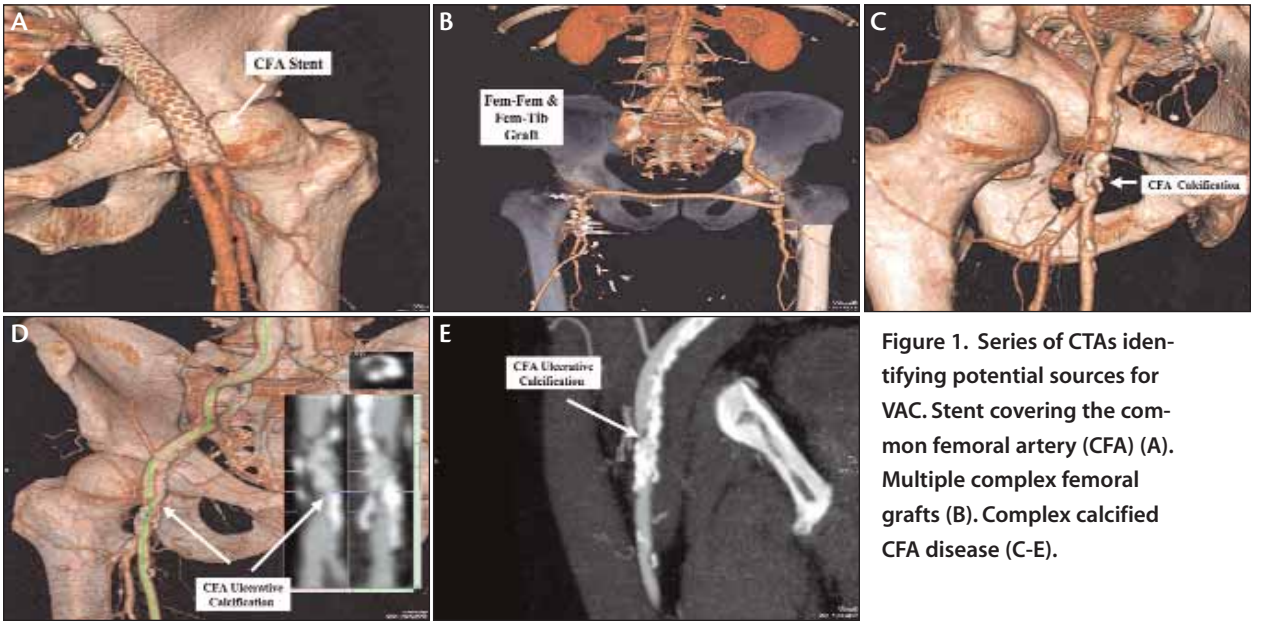

Figure 1. Series of CTAs identifying potential sources for VAC. Stent covering the common femoral artery (CFA) (A). Multiple complex femoral grafts (B). Complex calcified CFA disease (C-E).

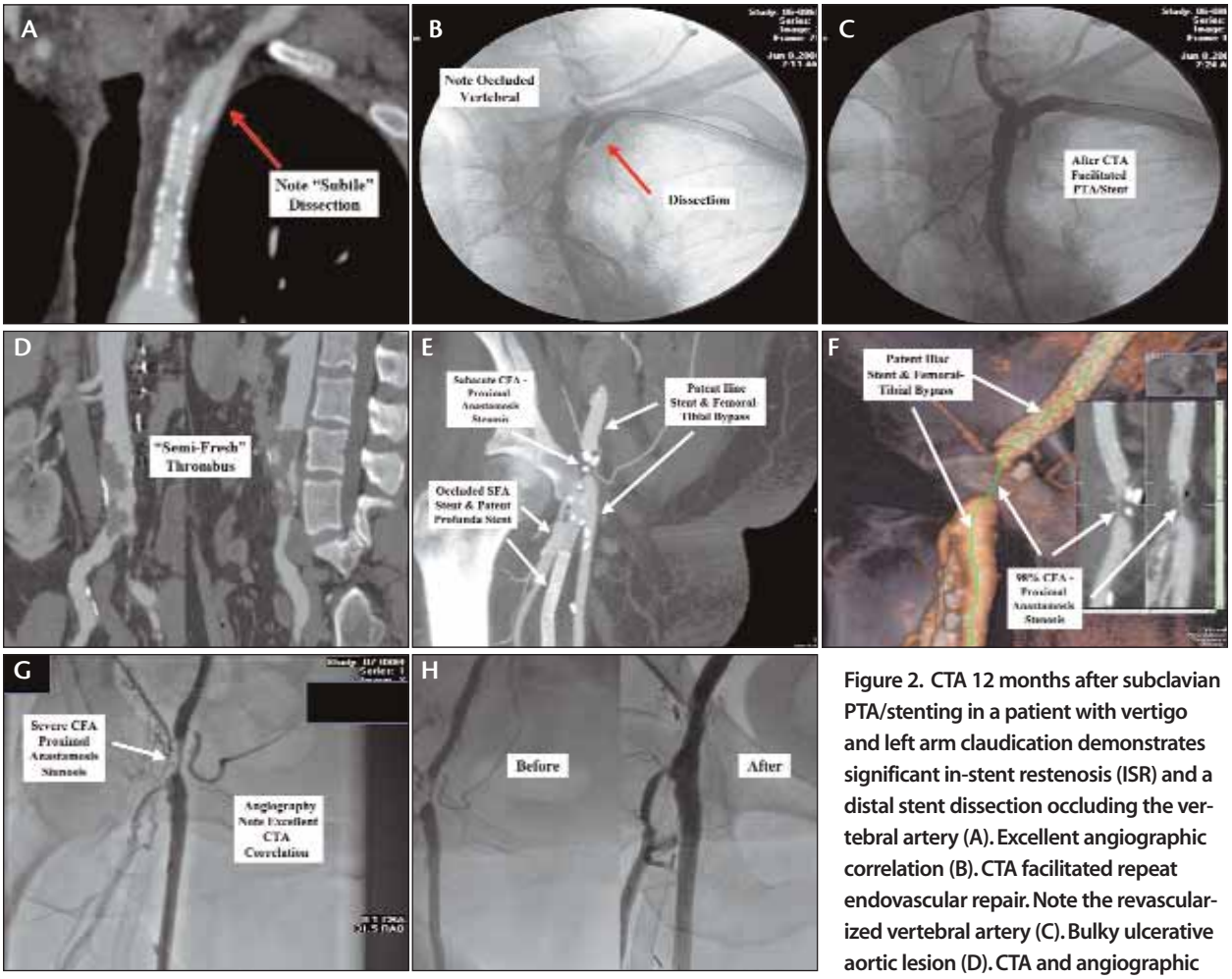

Figure 2. CTA 12 months after subclavian PTA/stenting in a patient with vertigo and left arm claudication demonstrates significant in-stent restenosis (ISR) and a distal stent dissection occluding the vertebral artery (A). Excellent angiographic correlation (B). CTA facilitated repeat endovascular repair. Note the revascularized vertebral artery (C). Bulky ulcerative aortic lesion (D). CTA and angiographic correlation after iliac-superficial-femoral-artery (SFA)-profunda stenting and femoral-tibial bypass. Note severe CFA stenosis and intimal hyperplasia (E-G). Treatment included plaque excision and cryoplasty with an embolic protection device (EPD) (H).

problematic and understated. The incidence of VAC after PVI is greater, with a reported incidence of 8% to 16%.[1] VACs are even more problematic and understated in the PVD patient.[1] As compared to the PCI patient, the PVI patient is often older, fragile, hypercoagulable, and has higher incidences of diabetes mellitus and chronic renal insufficiency (CRI), which all increase VAC rates. The PVD patient often has small access vessels, heavy femoral calcifications, poor or no femoral pulses, significant groin scarring from multiple previous procedures, complex femoral grafts, and previously deployed stents in close proximity to the CFA, further complicating vascular access (Figure 1).

One of the underestimated and understated clinical benefits of PV-CTA is the improved ability to choose the appropriate vascular access during PVI. We have drastically decreased our overall PVI case time and VACs since learning to use a preprocedural PV-CTA strategy. Preprocedural CTA has further reinforced the use of fluoroscopy for every groin before CFA access. The choice of alternative vascular access (ie, brachial, radial, axillary) has also been facilitated and expanded by PV-CTA. We very rarely "stick into disease" or have "surprises" today during vascular access. In our vascular access experience, PV-CTA has decreased VAC, expanded our use of PVI, and improved outcomes in patients who otherwise would have experienced a VAC, required major open surgical revascularization, or required amputation.

THERAPEUTIC PVD CASE PLANNING AND PERFORMANCE

PV-CTA also facilitates periprocedural planning for either PVI or surgical revascularization, including device options. We now make all decisions on carotid and abdominal aortic aneurysm (AAA) revascularization (PVI and surgery) and most lower-extremity revascularization decisions on PV-CTA, therefore eliminating the need and known risks associated with traditional angiography.

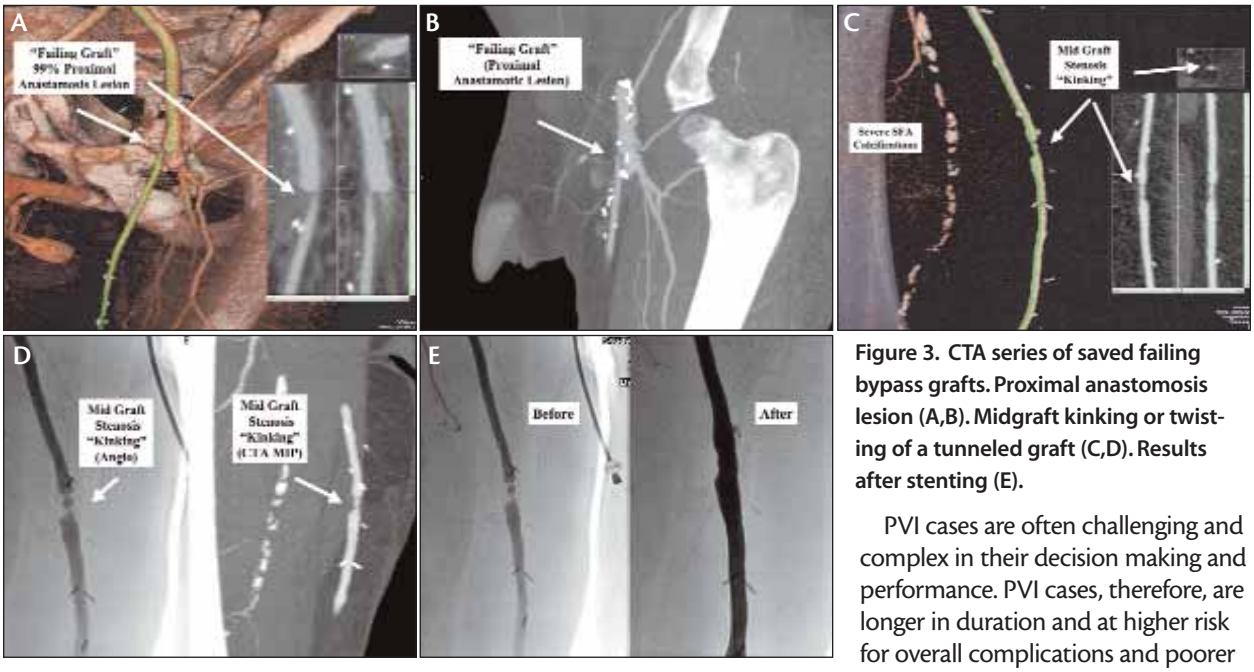

Figure 3. CTA series of saved failing bypass grafts. Proximal anastomosis lesion (A,B). Midgraft kinking or twisting of a tunneled graft (C,D). Results after stenting (E).

Lesion morphology assessment plays a key role in most clinical decision making, especially for PVI. Device planning during PVI is now determined before the procedure by PV-CTA lesion characteristics, such as calcification, ulceration, thrombus, dissections, soft plaque, and intimal hyperplasia (Figure 2). This information allows appropriate tailoring of PVI devices to the specific lesion or lesions to be treated. Examples of these decisions include PTA, cutting-scoring balloon PTA, laser atherectomy, plaque excision, orbital atherectomy, cryoplasty, bare-metal stents, covered stents, mechanical thrombectomy, and primary thrombolysis.

Exact vessel sizing becomes clinically important when planning balloon-expandable stent placement in renal, mesenteric, iliac, vertebral, and other ostial PVD lesions. Likewise, more accurate vessel sizing during nitinol stenting for a wide range of PVD cases (aortic, carotid, venous, etc.) helps case performance and improves outcomes. Detailed vascular anatomy assists with decisions regarding EPD use in carotid, renal, and lower-extremity PVI. We have found PV-CTA lesion characteristics (thrombus, ulcerative lesions, etc.) and vascular anatomy to be particularly helpful in identifying patients at higher risk for periprocedural distal emboli when imaging complex critical limb ischemia (CLI) cases. We have lowered our threshold for EPD use in this high-risk patient population with encouraging results. Additionally, chronic and subacutely thrombosed popliteal artery aneurysms often masquerade as atherosclerotic occlusions on traditional angiography. We have found CTA valuable in identifying the extraluminal components of this pathology, resulting in covered stent versus bare-metal stent treatment with improved outcomes.

PVI cases are often challenging and complex in their decision making and performance. PVI cases, therefore, are longer in duration and at higher risk for overall complications and poorer outcomes than PCI. We believe pre- and periprocedural PV-CTA planning facilitates PVI case performance and has dramatically decreased our overall procedure times, radiation and contrast exposure, and VACs, facilitating improved outcomes.

A typical lower-extremity PVI work-up and case would proceed as follows. An abdominal CTA with runoff would be obtained. This information would identify renal artery stenosis (RAS) and provide an accurate detailed roadmap of the entire supraceliac aorta to the toes. Traditional drive-by renal angiography has been eliminated. All inflow and outflow anatomy and disease burden with morphology are identified. Vascular access and approach, wires and sheaths, and therapeutic devices are planned beforehand. Vascular access is efficiently performed, and the wire sheath is driven safely to the appropriate vascular segment using CTA information without contrast injection. Chronic total occlusions (CTOs) of the superficial femoral artery (SFA) are often crossed with a .035-inch Glidewire (Terumo Interventional Systems, Somerset, NJ) and Quick-Cross catheter (Spectranetics Corporation, Colorado Springs, CO) using CTA information without contrast injection. Confirmatory angiography is then performed, and the appropriate PVI is performed, all facilitated by preprocedural PV-CTA with drastically diminished contrast use.

SURGICAL BYPASS GRAFT SURVEILLANCE

Creative surgical bypass remains an integral part of all limb salvage programs, and all grafts require close follow-up imaging surveillance. The same can be said for endovascular PVI procedures. Contemporary bypasses often require cre-

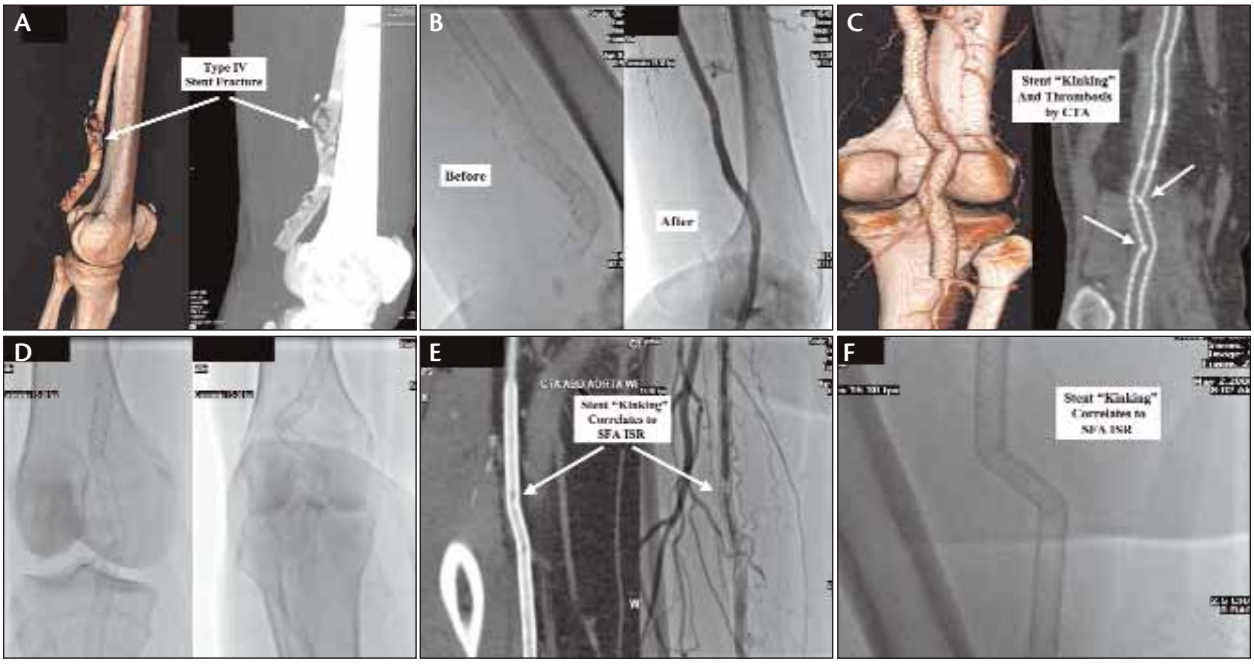

Figure 4. CTA of a patient with posterior knee pain without claudication 18 months after PTA/stenting demonstrating a type IV stent fracture (A). Angiography after covered stent repair (B). CTA after SFA-popliteal stenting demonstrating stent kinking and thrombosis (C). Dynamic bent-knee fluoroscopy further illustrating kinking without significant fracture (D). CTA and angiogram of a patient with claudication after SFA stenting demonstrating kinking and ISR (E). Dynamic bent-knee fluoroscopy further identifies kinking (F).

ative anastomosis (composite, vein patch, etc.), alternate conduit acquisition (arm veins, donor veins, etc.), and extra-anatomic routes to poor distal tibial vessels predisposing contemporary grafts to poor outcomes more frequently than traditional femoropopliteal grafts of the past (Figure 3). Consequently, we believe contemporary bypass grafts require very detailed surveillance often not achievable with duplex ultrasound. Furthermore, traditional angiography in patients with post-bypass grafts is complex and associated with increased VAC. We avoid sticking any bypass graft unless no other access is available, because any disruption of the graft neointima often leads to an obstructive neointimal flap after PVI, increasing the risk of subacute graft thrombosis between 7 and 30 days after the procedure. PV-CTA has eliminated our need for bypass graft sticks. Willmann et al have even reported 98% sensitivity and specificity in comparing CTA versus angiography in 85 bypass grafts.[2]

PERIPHERAL STENT INTERROGATION

Unlike coronary stents which are small and poorly imaged on CTA, peripheral stents are larger and current software makes CTA an excellent tool for detailed stent interrogation for fracture, kinking, crushing, tine apposition, expansion, ISR, edge dissection, etc. (Figure 4). Contemporary nitinol stents have proven to fracture less than previous designs in the SFA, but fractures still remain a concern with clinical implications.[3,4] Balloon-expandable stents also have been reported to fracture in treating RAS, chronic mesenteric ischemia (CMI), and PCI. We have found PV-CTA stent interrogation, especially under magnification, to be helpful in our clinical decision making.

NONATHEROSCLEROTIC VASCULAR DISEASE

CTA assists the clinical management in a wide variety of nonatherosclerotic vascular pathologies, including vascular tumors, carotid body tumors, inflammatory diseases (eg, Takayasu's arteritis), and arteriovenous malformations (AVMs). We have recently treated a patient with a carotid body tumor and a patient with a head-neck AVM in which CTA provided all necessary diagnostic and therapeutic information, enabling excellent overall outcomes (Figure 5). Both patients' CTAs revealed large feeder vessels, facilitating endovascular vessel coiling immediately before definitive surgical resection (Figure 6). The preprocedural CTA strategies facilitated performance of the surgical procedures and decreased intraoperative blood loss.

INCIDENTAL VASCULAR AND NONVASCULAR DISEASE

CTA imaging also retains traditional CT nonvascular tissue acquisition capabilities. Occult neoplasms, severe degenerative arthopathies, spinal stenosis, and cholelethi-

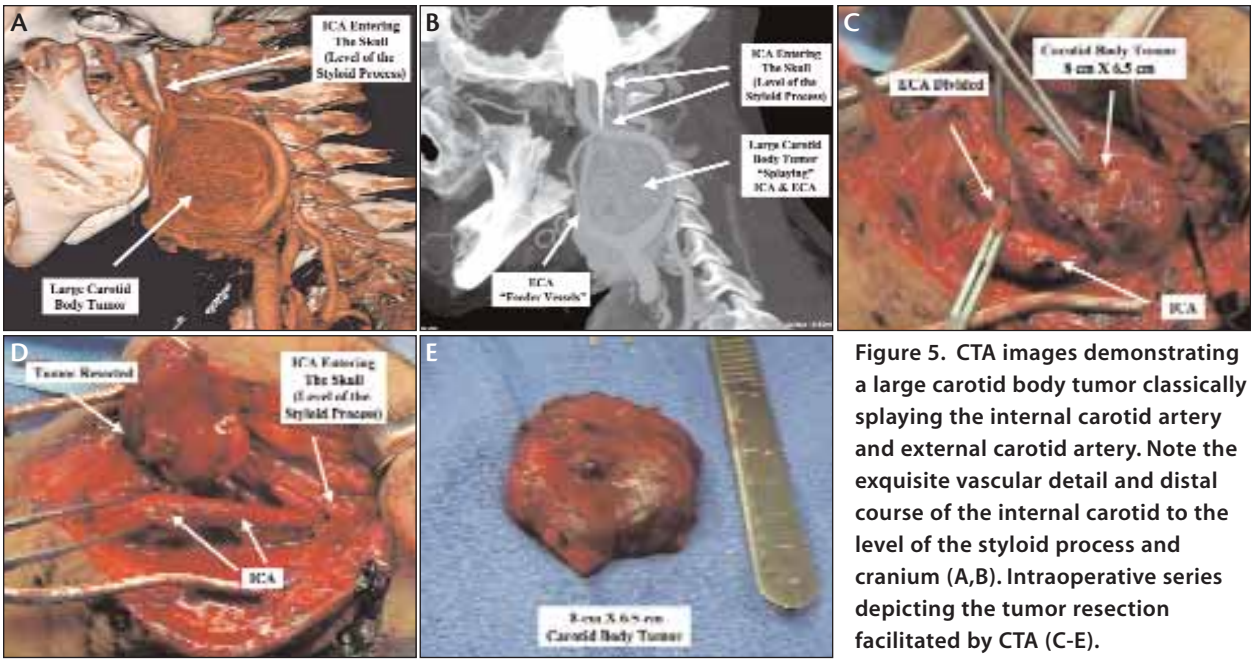

Figure 5. CTA images demonstrating a large carotid body tumor classically splaying the internal carotid artery and external carotid artery. Note the exquisite vascular detail and distal course of the internal carotid to the level of the styloid process and cranium (A,B). Intraoperative series depicting the tumor resection facilitated by CTA (C-E).

asis are examples of additional clinical information with therapeutic implications that are frequently encountered during PV-CTA. It is not unusual to diagnose spinal stenosis by CTA in patients who remain symptomatic after successful extremity revascularization for severe PVD.

Most large-scale image-based cancer screening programs have not been found to be cost effective. The highly selective PVD population may become an exception because this is an older population with high incidences of smoking, diabetes mellitus, and hypertension. The upper and lower lung fields are usually visualized during carotid and extremity CTA, often providing insight into pulmonary pathology. Similarly, solid tumors and soft tissue pathology are regularly identified in this highly selected elderly PVD population. The use of nonvascular CT now comprises 8% to 10% of our daily imaging schedule, resulting in the identification of nonvascular pathologies, therefore enabling earlier diagnosis, improved patient outcomes and frequent referrals to non-CV specialties, fostering even more CV referrals in return.

Severe RAS, mesenteric artery disease, AAA, iliac, visceral, and popliteal artery aneurysms are also frequently encountered during abdominal CTA with runoff for the assessment of lower-extremity occlusive disease. Likewise, vascular occlusive disease is often encountered in patients being investigated for vascular aneurysmal disease. The identification and treatment of unknown RAS during the treatment of patients with CLI and AAA is commonplace in our practice and facilitates the overall therapeutic care of this high-risk patient population.

SELECTED PERIPHERAL VASCULAR CONDITIONS

Critical Limb Ischemia

We frequently have patients present from out of state or out of the US with the chief concern that their leg will be amputated because they have been told that they have no blood vessels below the knee. Invariably, these are complex patients who have multiple previous procedures (PVI and surgery), have significant comorbidities, and present with minimal medical records and poor recent imaging. Most will have an inadequately performed angiography with poor visualization of all infrainguinal vessels and indeed no visualized distal targets (Figure 7A-C). It is rare that an outside CLI patient presents with a CTA or magnetic resonance angiography.

We have found CTA of the infrainguinal and infrapopliteal arteries particularly helpful in periprocedural planning in complex CLI patients, despite significant calcification still being problematic. Using a CLI-CTA protocol with a delayed second lower-extremity scan from the knees to the toes, we regularly identify patent distal infrapopliteal and pedal vessels—distal targets—that were not previously imaged during angiography. Contemporary postprocessing software allows vessel magnification, automated region growing techniques, osseous segmentation, curved planar reconstruction, maximal intensity projections, semitransparent volume rendering, vessel tracing to the foot, vessel probing with automated measurements, all as three-dimensional image reconstructive tools designed to allow maximal contrast opacification and infrapopliteal vessel identification and analysis (Figure 7D,E).

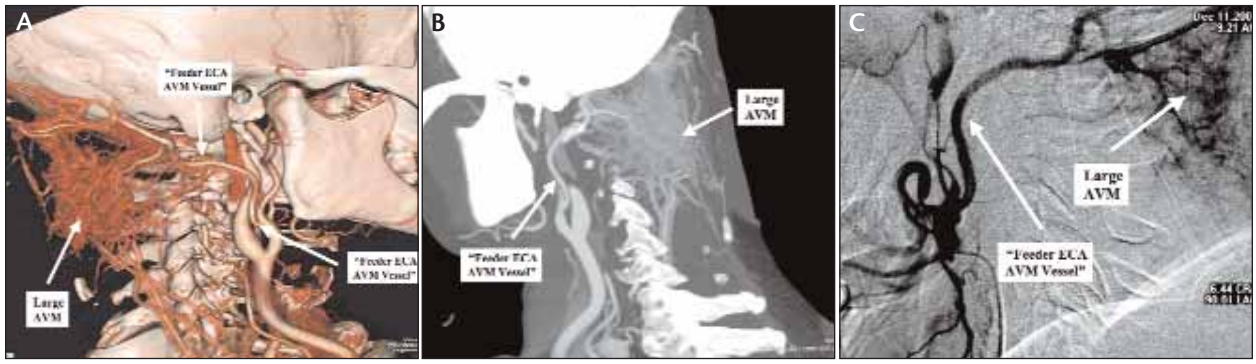

Figure 6. CTA images of a large AVM identifying all anatomic and vascular detail including a large feeder vessel from the external carotid artery (A,B). The large feeder vessel was identified during angiography/digital subtraction angiography and coiled, facilitating definitive surgical resection (C).

We advocate at least an outpatient noninvasive CLI-CTA on all patients before amputation. The identification of these CTA-identified but nonangiography-identified vessels has significant therapeutic implications for the CLI patient by enabling appropriate PVI or surgical bypass planning strategies. We strongly suspect that many amputations are performed daily because of no identifiable distal targets during traditional angiography, which are likely identifiable with CTA. Detailed distal target vascular lesion morphology and vessel sizing are also identifiable with CTA (Figure 7D,E). CTA will likely play an increasing role in lower-extremity PVI follow-up with the use of infrapopliteal stenting now becoming more prevalent. Several recent publications favorably comparing CTA to magnetic resonance angiography in infrapopliteal arteries are further supportive of CTA.[5,6]

Chronic Mesenteric Ischemia

Chronic mesenteric ischemia (CMI), both symptomatic and asymptomatic, remains underdiagnosed and therefore underappreciated. CMI remains difficult to diagnose both clinically and by traditional imaging techniques. In our experience, CMI is progressive and more common than previously reported. This appears analogous to our understanding, or misunderstanding, of the natural history of RAS several decades ago. Kolkman et al and Thomas et al have reported a 34% and 27% incidence, respectively, of asymptomatic CMI progressing to acute mesenteric ischemia within 2- to 3-year follow-up, especially with multivessel involvement.[7,8] It is known that the mortality and morbidity rates of progressive CMI are high, with mortality rates of 40% to 50% when progressing to acute mesenteric ischemia. Likewise, traditional surgical bypass is complex in these often debilitated patients, and therefore is associated with high morbidity rates.

Several recent reports have shown the benefits of PTA/stenting in treating CMI. There are no large reports of the role of CTA in managing patients with CMI, but our experience has indicated that CTA is very accurate in evaluating occlusive disease in the superior mesenteric artery (SMA), inferior mesenteric artery (IMA), and the celiac artery (CA). Postprocedural stents are well imaged; therefore, follow-up CTA becomes helpful because the incidence of visceral vessel ISR has been reported at 10% to 20% at 24 months. The CA can be compressed by extrinsic forces, such as motion and the median arcuate ligament. CTA can be beneficial in identifying these extrinsic forces by interrogating the soft tissues anterior to the CA and noting the lesion morphology associated with any CA occlusive disease. A smooth anterior CA defect would be suspicious of median arcuate ligament compression, while a calcified, concentric "bird-beaking" occlusive pattern would be more indicative of atherosclerotic disease (Figure 8). These visceral vessels often have significant poststenotic dilation; exact vessel sizing information therefore becomes important for PTA/stenting. CTA additionally can identify unknown splenic, mesenteric, hepatic, and renal artery aneurysms.

An abdominal CTA with runoff for CLI has helped us identify a fairly large patient population, also harboring severe RAS and CMI, because image acquisition begins above the CA. On further history, many of these patients have nonclassic abdominal symptoms, including nausea, vomiting, diarrhea, cramping, mild weight loss, and have been diagnosed or labeled as having "gastritis" or "nonspecific colitis" by endoscopy after their cholecystectomy. These nonclassic symptoms are likely due to CMI, and this has now been identified as "ischemic gastropathy" and is thought to occur in 20% to 30% of all patients with CMI.[9] Considering the progressive and unpredictable history of CMI, we have utilized CTA as an integral tool in the diagnosis, management, and follow-up of

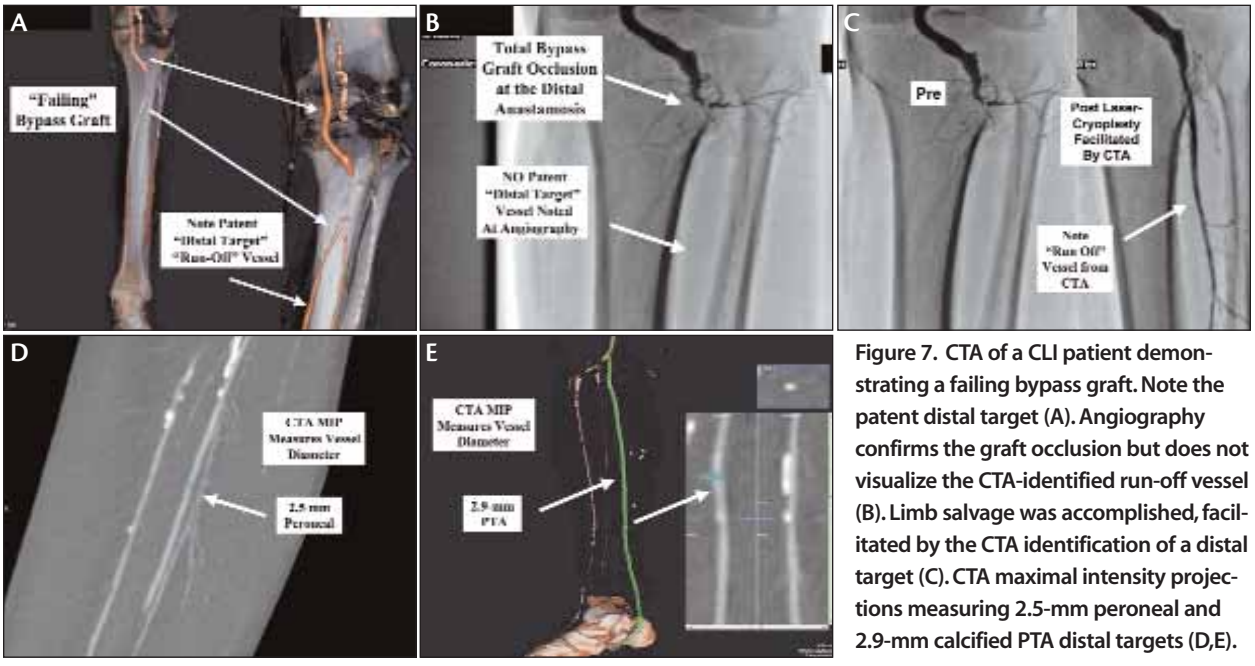

Figure 7. CTA of a CLI patient demonstrating a failing bypass graft. Note the patent distal target (A). Angiography confirms the graft occlusion but does not visualize the CTA-identified run-off vessel (B). Limb salvage was accomplished, facilitated by the CTA identification of a distal target (C). CTA maximal intensity projections measuring 2.5-mm peroneal and 2.9-mm calcified PTA distal targets (D,E).

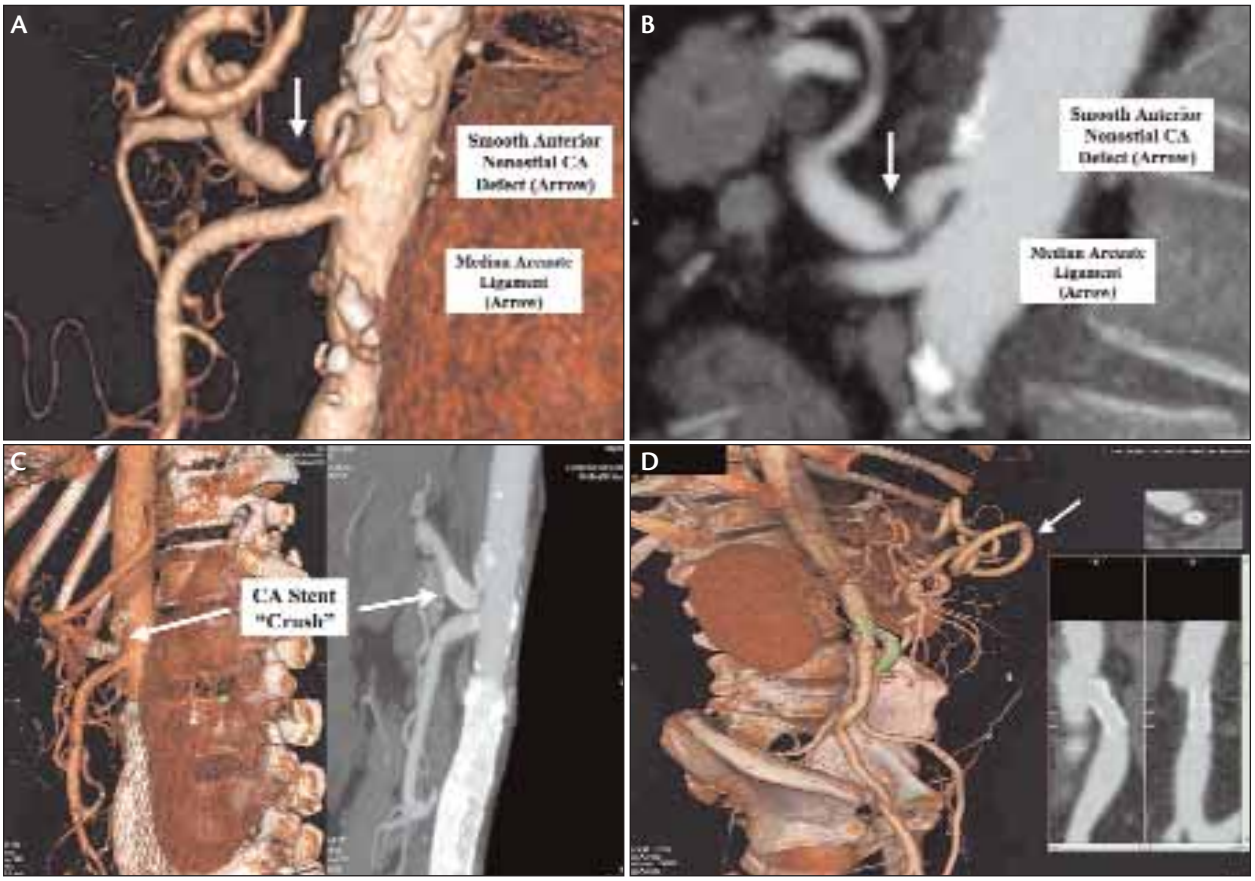

Figure 8. CTA demonstrating smooth anterior defect in the proximal CA suspicious for median arcuate ligament compression (A,B). CTA in a post-EVAR and CA-stent patient demonstrating CA stent crushing (C). IMA stent demonstrates no ISR at 2 years. Note total occlusions of the CA and SMA and large collateral of Drummond (arrow) (D).

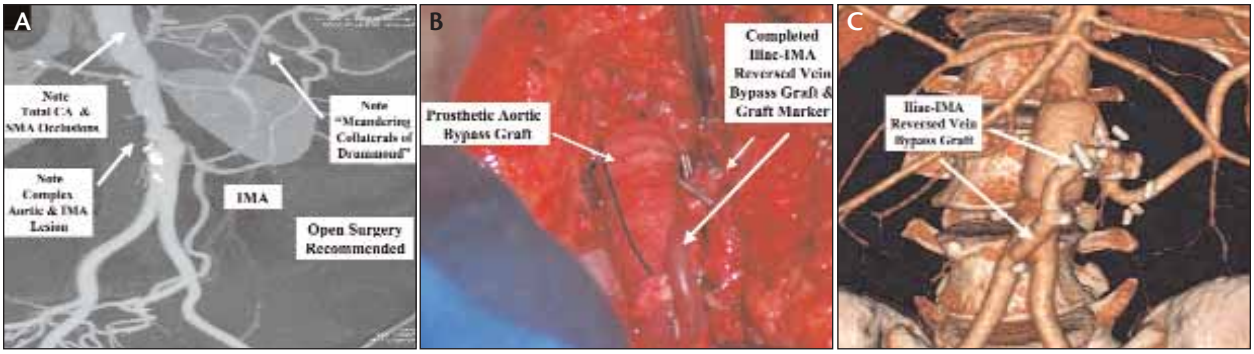

Figure 9. CTA in a patient with severe claudication, abdominal pain, 100% CA and SMA occlusion, with a complex, ulcerative aortic stenosis and 95% ostial IMA stenosis (A). Surgical bypass of the aorta and IMA was recommended on the CTA findings (B). CTA follow-up shows excellent interposition IMA graft patency (C). The entire diagnosis, treatment recommendation, and follow-up management were facilitated by PV-CTA.

patients with CMI (Figure 9). We have recently reported our 9-year analysis of 99 CMI vessels treated with PTA/stenting with a 2-year CTA follow-up in 48 vessels.[10] Similar to other reports, we reported a procedure success rate of 97.9%, a clinical success rate of 91%, a low complication rate (1.8%), and a 19% ISR rate at 24 months.

PV-CTA AND CONTRAST-INDUCED NEPHROPATHY

McCullough et al reported a 14% incidence of contrast-induced nephropathy (CIN) in PCI, with high mortality and morbidity rates.[11] The incidence and impact of CIN in PVI is unknown but likely grossly underestimated. The PVI patients (versus PCI) are usually a decade older, require multiple primary and secondary reinterventions and contrast exposures, and have a higher incidence of diabetes mellitus and pre-existing CRI. The creatinine clearance (CrCl), not just a serum creatinine (Cr), should be calculated on all PVD patients because the risk of CIN is highly correlated with CrCl.

We believe the highest risk of CIN in the PVD patient occurs during PVI, because the risk of CIN is highly associated with intra-arterial contrast exposure and volume. CIN is much less associated with intravenous (IV) contrast exposure as used during PV-CTA. We have created a totally outpatient PV-CTA environment in our office and therefore have taken "full ownership" in all CIN-related issues. We have developed CIN protocols to decrease IV contrast exposures to 70 to 100 mL while retaining imaging quality. We have created an outpatient holding area equipped to provide 4 to 6 hours IV hydration before and after PV-CTA along with oral preprocedural hydration protocols. We have found CT-induced nephropathy to be exceedingly rare with proper patient selection and adherence our CIN protocols. This preprocedural intravenous PV-CTA contrast strategy has allowed us to drastically decrease our periprocedural intra-arterial contrast exposure and CIN incidence during both PVI and PCI.

PV-CTA performed for limb salvage should always include an abdominal CTA with runoff to identify access issues and to identify unknown critical RAS. RAS is very common in this patient population that often simultaneously presents with CRI and is at risk for CIN. We readily treat RAS in this setting, because we believe it leads to improved overall outcomes and decreases the incidence of CIN in these patients who often require contralateral limb salvage and frequent secondary reinterventions and therefore secondary contrast exposures.

VENOUS DISEASE (PV-CTV)

Contemporary CTA has become the gold standard in diagnosing pulmonary embolus with a sensitivity and specificity approaching 100%.[12] The current clinical role of CT in the systemic venous system (CTV) remains poorly defined despite the fact that adequate and even detailed images of the inferior vena cava (IVC), superior vena cava, brachiocephalic veins, and iliofemoral venous system can be obtained with the appropriate imaging acquisition and postprocessing protocols. Analogous to the revolutionary role CTA has played in the management of peripheral arterial disease, we are increasingly using PV-CTV in our endovascular management of venous disease.

Our early experience with venous CTV has been favorable, and CTV has now replaced traditional venography in evaluating deep vein thrombosis (DVT). Abdominal and pelvic CTV with runoff readily identifies the extent of the thrombus and can identify the proximal iliac vein and IVC, therefore rendering a diagnosis and providing access information (popliteal approach versus contralateral, antegrade approach, etc.). The vascular access and approach strategy is even more critical

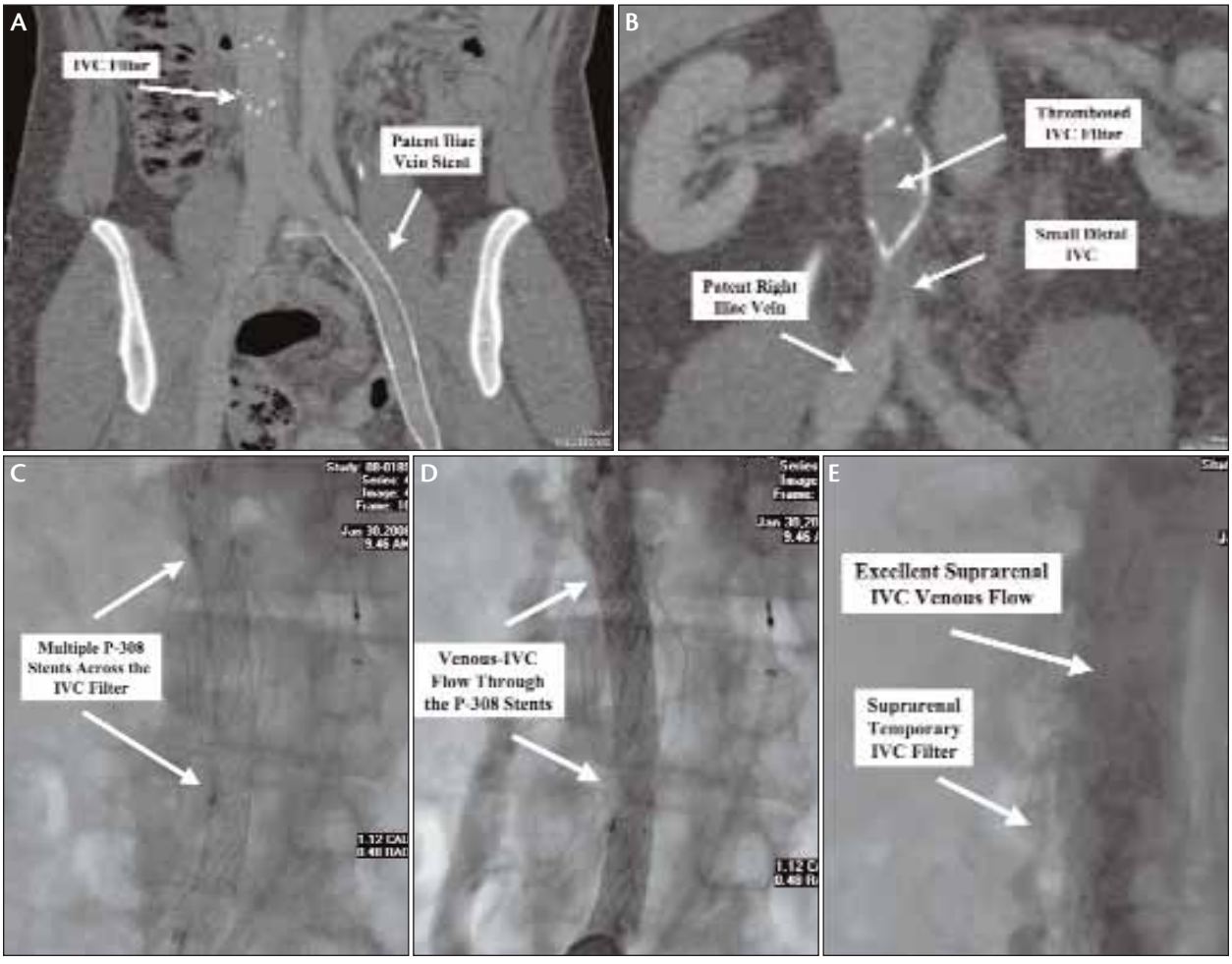

Figure 10. CTV demonstrates patent left iliac vein after PTA/stent with minimal ISR in a patient with May-Thurner syndrome (A). CTV identifies a thrombosed IVC filter in a patient with a small chronically scarred IVC with patent iliofemoral veins (B). Multiple P-308 stents placed across the thrombosed filter with return of venous flow (C,D). Excellent suprarenal IVC flow was obtained. All aspects of the case were aided by CTV. Note the suprarenal IVC temporary second filter (E).

during venous PVI than arterial PVI, because periprocedural IV contrast injections are very difficult to perform and interpret. Vessel sizing, thrombus burden-chronicity determination, aberrant collateral vessels, and identifications of any extrinsic compression (May-Thurner syndrome) have obvious clinical implications. We have found CTV after iliac vein PTA/stenting to be more helpful in identifying ISR than duplex ultrasound surveillance (Figure 10A).

Recent Venous Case Study

We recently treated a morbidly obese patient with severe acute bilateral leg, scrotal and lower abdominal pain, erythema, and edema after an orthopedic procedure. The patient had a history of DVT, pulmonary embolus, and an IVC filter in place. A clinical diagnosis of IVC filter thrombosis had been made, and the patient was discharged home having been told that nothing could or should be done at an outside facility. An abdominal-pelvic-bilateral limb CTV was obtained utilizing 100 mL IV contrast, Isovue-370 (iopamidol, Bracco Diagnostics Inc., Princeton, NJ). CTV identified a more chronic-scarred IVC with a thrombosed infrarenal IVC. The right iliofemoral venous system was patent without DVT. The left iliofemoral venous system was small with chronic and acute thrombus (Figure 10B-E). The diagnosis was confirmed, access identified, and an interventional strategy planned, facilitated by CTV.

Multiple large Palmaz P-308 stents (Cordis Corporation, Warren, NJ) were obtained, and 24-hours after admission, a temporary IVC filter was placed in the suprarenal IVC, the thrombosed IVC was crossed, and a short run of mechanical thrombectomy using the AngioJet (Possis Medical Inc., Minneapolis, MN), and

FUTURE CTA TECHNOLOGY INNOVATIONS

GE Healthcare Technologies

General Electric (GE Healthcare Technologies, Wauwatosa, WI) innovations will focus on their new high-density (HD) CT technologies (Figure 1). HDCT technology aims to create a new scintillator material by modifying the molecular structure of brilliant garnet, resulting in a modified gemstone of 4,600 karat. This new detector has the potential to allow imaging of the entire body with 30% improved clarity, 100 times faster, and with 50% less radiation dose. These are noted to be investigational technologies and not yet FDA-approved.

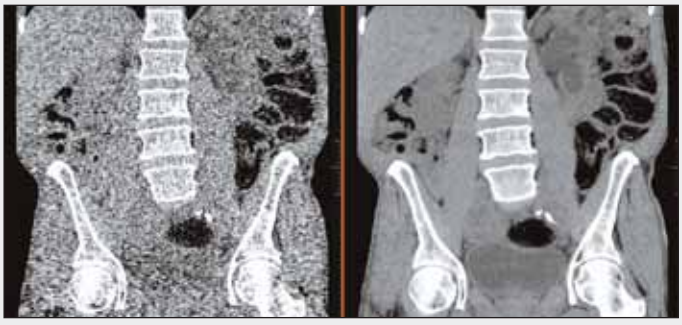

Figure 1. Today's standard, the 64 slice CT (left). Note the boost in clarity seen in the image produced by GE's HDCT technologies (right).

Philips Medical Systems

Philips Medical Systems (Bothell, WA) has recently introduced the 256-slice Brilliance iCT scanner, which will allow radiologists to quickly produce high-quality images, including complete coverage of the heart and brain (Figure 2). Brilliance iCT can capture an image of the entire heart in just two beats. One of the benefits of this technology is that it will reduce x-ray exposure and radiation doses by up to 80%. The scan time is also quicker because the gantry rotates 4 times in 1 second—22% faster than current systems. Brilliance iCT and a new 64-channel system both have new x-ray tubes, detectors, and reconstruction design elements, providing detailed three-dimensional images of an entire organ, as well as images depicting changes over time. The Brilliance iCT is 510(k) approved.

Figure 2. A carotid CTA obtained with the Philips Brilliance iCT scanner.

the power-pulse spray technique was performed. Multiple P-308 stents were placed across the IVC filter and aggressively postdilated, pushing the IVC filter elements aside, therefore relining the entire IVC with stents and creating a large channel for venous outflow (Figure 10B-E). One week later, the temporary filter was removed, and stent patency was confirmed. The patient was discharged in 72-hours with drastic improvement of all symptoms. Almost weekly, we identify more clinical uses for CTV.

CONCLUSION

PV-CTA has not only replaced traditional peripheral angiography in our practice, PV-CTA has become an integral clinical tool in our overall interventional, surgical, and medical management, and follow-up of patients with PVD. With increasing PV-CTA experience, we continue to find more and more clinical benefits of PV-CTA for our PVD patients. ■

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Siemens Medical Solutions USA, Inc.

The Somatom Definition AS (Siemens Medical Solutions USA, Inc., Malvern, PA) offers a large-volume coverage area with a 200-cm scan range, 78-cm gantry bore, and the ability to add a high-capacity 650-lb patient table. The Definition AS, available in 40-, 64- and 128-slice configurations, will allow even the most difficult patients (ie, trauma patients) to be imaged rapidly from head to toe (Figure 3). One of the benefits of the Definition AS is the Adaptive Dose Shield technology, which dynamically blocks unnecessary doses before and after the spiral scan, ensuring that the only dose applied to the patient is the dose that is clinically relevant. The Somatom Definition AS is pending 510(k) review and is not yet commercially available in the US.

Figure 3. A vascular study obtained with the Siemens Somatom Definition AS.

Figure 4. Toshiba's Aquilion One CT acquires an image of the entire lung with 0.5-mm detector elements.

Toshiba America Medical Systems, Inc.

Toshiba America Medical Systems, Inc. (Tustin, CA) has already commercially introduced their 320-detector row Aquilion One CT System technology worldwide, including Johns Hopkins University and Brigham and Womens in the US. This innovation enables dynamic volume scanning, allowing temporal image volume acquisition for whole organs (Figure 4), resulting in the visualization of dynamic flow and perfusion. The greatest benefits are expected to be in cardiac-coronary CTA and in neuro CTA evaluations for stroke. It must be stated that 0.5 mm X 64-slice and even 0.5-mm X 16-slice PV-CTA have already proven to be the gold standard in the management of PVD. The Aquilion One dynamic volume CT expects to further expand CTA workflow with robust indications in total-body organ analysis in oncology, orthopedics, pulmonology, etc. Additional potential benefits include a further reduction in radiation dosage, contrast volume, and overall scan times, therefore facilitating daily CTA work throughput.

est in any product or manufacturer mentioned herein. Dr. Ingraldi may be reached at (800) 582-2435; agostino.ingraldi@cardio.com.

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