

Endovascular management of TransAtlantic Inter-Society Consensus D iliac artery occlusion secondary to radiation arteritis

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ABSTRACT

Management of limb ischemia caused by radiation injury can be challenging. Atypical conduits or tunnels have been used for bypass through or around the injured area. Application of endovascular therapy for revascularization has not been widely published. Standard and alternative access sites with or without hybrid arterial adjuncts can be used successfully in cases in which surgical bypass is prohibitive. We describe a case of limb salvage in a patient treated with high-dose radiation for recurrent endocervical adenocarcinoma using a hybrid open surgical and endovascular approach. (*J Vasc Surg Cases and Innovative Techniques* 2018;4:109-11.)

CASE REPORT

A 51-year-old woman with a past medical history of recurrent stage IBC2 endocervical adenocarcinoma presented with progressive bilateral rest pain and paresthesia. She had received chemotherapy in 2011 and 4500 cGy external beam radiation to cervix, bladder, and rectum, then 3500 cGy brachytherapy. Four years later, she presented with difficulty in ambulating and bilateral foot pain. Neurologic workup included magnetic resonance imaging, which revealed mild spondylosis of L3-S1 and spinal stenosis with neuroforaminal narrowing at L4-5. Neurologic examination was notable for 5-/5 weakness of left tibialis anterior and extensor hallucis longus muscles. The neurology service concluded that she had neuropathy from prior chemotherapy and that her worsening pain and left toe cyanosis warranted vascular evaluation. Our physical examination demonstrated a cachectic woman without palpable femoral or distal pulses bilaterally. Her feet were discolored with rubor, and the left foot had cyanosis of the toes. Her foot-drop became progressive during the next 4 months. Noninvasive studies demonstrated flat digit waveforms bilaterally with nonobtainable toe pressures. There was no skin damage noted over the pelvis or groins. Her clinical course was further

complicated by radiation effects, such as bowel obstruction with perforation, multiple reoperations, creation of a stoma, resultant colovesical fistula, and ureteral obstruction.

Computed tomography angiography demonstrated common iliac artery (CIA) stenosis, bilateral long-segment external iliac artery (EIA) and common femoral artery (CFA) occlusions, and heavily diseased internal iliac arteries (Fig 1) consistent with TransAtlantic Inter-Society Consensus II (TASC II) D lesions. It was thought that she was having intermittent bacteremia related to her colovesical fistula. Initial consideration of extra-anatomic bypass to avoid a hostile abdomen would place her at risk for graft infection. The general surgery service would need to treat the fistula first. During this time, her leg symptoms became debilitating. Revascularization was needed. In an effort to avoid placement of prosthetic graft material, an endovascular approach was attempted. By left brachial artery access, an initial attempt to cross the left EIA failed because of the presence of flush occlusion at its origin. Subsequently, the right EIA lesion (measuring 12.25 cm into the CFA) was successfully crossed with re-entry into the distal CFA. Predilation up to nominal pressure for 3 minutes with a 5-mm × 20-cm balloon was performed, then two bare-metal self-expanding stents (6 × 40 mm and 6 × 80 mm with 30-mm overlap) to the distal EIA and a balloon-expandable stent (6 × 18 mm with 1-cm overlap) proximally at the takeoff of the EIA to address underexpansion of the self-expanding stent were deployed. Completion angiography demonstrated an excellent result with preserved patency of the hypogastric artery (Fig 2).

One week later, treatment of the left side was planned. Considerations included a hybrid approach vs a surgical option of femoral-femoral bypass using cryopreserved cadaveric superficial femoral artery. Open left CFA exposure permitted retrograde access crossing through the EIA total occlusion with re-entry into the proximal CIA (lesion length of 11.5 cm). An 8- × 39-mm balloon-expandable bare-metal stent was used to treat the left CIA, then extended across the hypogastric artery using a 6- × 150-mm self-expanding stent with 2-cm overlap. Postdilation was performed with a 6-mm × 6-cm balloon. Some of the stent tines extended to the CFA, which was

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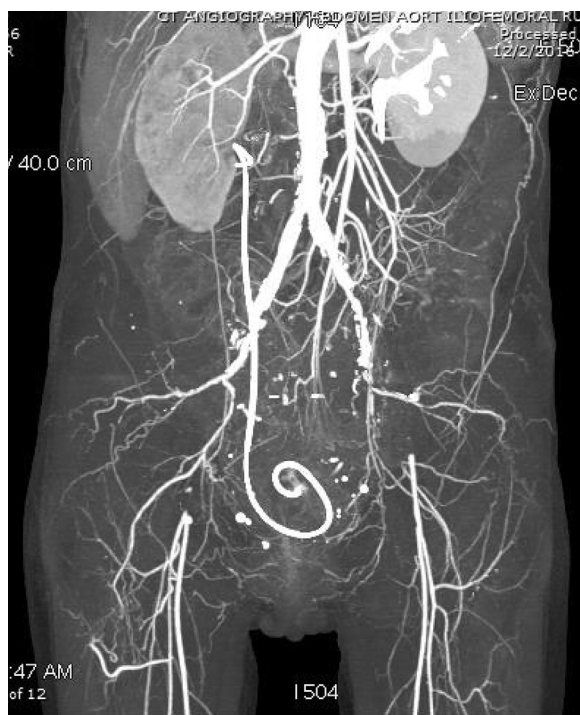


Fig 1. Computed tomography angiography reconstruction demonstrating stenosis of left common iliac artery (CIA) and complete external iliac artery (EIA) occlusions at the level of bifurcation with reconstitution at the superficial femoral artery-profunda femoral artery junctions bilaterally.



Fig 2. Completion angiography after right external iliac artery (EIA) revascularization demonstrating good inflow into superficial femoral and profunda femoral arteries and preserved patency of the internal iliac artery.

patched with bovine pericardium without endarterectomy. Completion angiography demonstrated good runoff into the superficial femoral artery (Fig 3).

After revascularization, she had return of palpable pedal pulses bilaterally, recovered uneventfully, and was discharged from the hospital on postoperative day 4 to permit physical therapy evaluation for deconditioning. Postoperatively, the patient reported resolution of symptoms, including her footdrop, and remarkable improvement in her noninvasive studies that demonstrated a right ankle-brachial index (ABI) of 1.17, left ABI of 1.12, right toe-brachial index of 1.04, and left toe-brachial index of 0.91 with normal waveforms. She was continued on aspirin 81 mg and clopidogrel 75 mg daily.

Eight months later, she underwent definitive intestinal and ureteral diversion to address her colovesical fistula. One week later, she developed coolness and pain of her left leg. Computed tomography angiography revealed thrombosis of her left iliac system down to the distal CFA. Catheter-directed thrombolysis with tissue plasminogen activator at 1 mg/h resolved this within 12 hours. No causative lesion was noted on the completion angiogram. Pulses were restored. She received anticoagulation for 3 months after thrombolysis. She will continue aspirin and clopidogrel. Eight months after the original procedure, duplex ultrasound of the left iliac and femoral arteries revealed widely patent vessels. She now can walk independently without a walker, and her left foot strength has returned. Follow-up will

be at 1 month, 3 months, and then every 6 months with ABI and duplex ultrasound of her stents.

Informed consent for publication was obtained from the patient.

DISCUSSION

The pathogenic effects of radiation on vasculature are attributed to the high radiosensitivity of endothelial cells, fibrosis of the medial and adventitial layers, and damage to the vasa vasorum.¹ The presentation of radiation-induced occlusive arterial disease is variable, ranging from 2 to 47 years after initial radiation therapy, with a median of 11 years.² Presenting symptoms of pain, numbness, and tissue degeneration are similar to those of peripheral arterial disease.

Vasculature in different parts of the body demonstrates varying tolerance to radiation dosage; iliofemoral arteries show radiographic changes after 39 to 80 Gy.² Furthermore, although lesions in the iliofemoral region most often present >10 years after irradiation, atherosclerosis can accelerate ischemic symptoms.³ A key differentiating feature between atherosclerotic occlusion and radiation arteritis is the relative sparing of surrounding nonirradiated arteries. The localized nature of arterial occlusions after irradiation makes these lesions amenable to bypass, which has been the traditional approach. However, the use of prosthetic grafts to treat



Fig 3. Completion angiography after left common iliac artery (CIA) to proximal common femoral artery (CFA) revascularization demonstrating good runoff into the CFA.

occluded irradiated vessels may be complicated by graft infection. This was demonstrated by Phillips et al⁴ in up to 21% of their reported cases.

The use of percutaneous or hybrid endovascular and surgical interventions for aortoiliac occlusion has been previously reported in the literature,⁵ but there is a lack of information on the durability and efficacy of these interventions. In this case, a patient who received external beam irradiation for endocervical adenocarcinoma and additional brachytherapy for recurrence presented with classic symptoms of bilateral limb ischemia. The patient had a hostile abdomen with colovesical fistula and ureteral obstruction that would have increased her risk for graft infection; therefore, bare-metal stents were chosen.

A hybrid approach was successfully conducted with significant improvement in her ABI and resolution of presenting symptoms at her most recent follow-up 8 months postoperatively. Previously reported cases of endovascular therapy for radiation arteritis have been limited to focal segment interventions.³ Our case demonstrates successful revascularization using angioplasty and stenting in radiation-induced bilateral long-segment iliofemoral artery occlusions with excellent short-term results. Open bypass is still an option if this fails as the colovesical fistula has now been addressed and her risk of graft infection is less. Close monitoring will be continued to prevent future limb ischemia.

CONCLUSIONS

Published reports regarding the endovascular management of radiation arteritis causing occlusive arterial disease are limited. The results of our case support endovascular intervention with adjunctive surgical techniques as a successful modality for radiation-induced long-segment arterial occlusions. Longer term follow-up is necessary to determine durability.

REFERENCES

1. Souza JE, Calvalcante LP, Bernardes MV, Parisati MH, Lacerda PS, Pereira RM. Acute limb ischemia secondary to radiation-induced arteritis: case report. *J Vasc Bras* 2013;12:243-6.
2. Pham HD, Prather MG, Rush DS. Percutaneous treatment of superficial femoral artery stenosis secondary to radiation arteritis. *Am Surg* 2016;82:1098-100.
3. Modrall JG, Sadjadi J. Early and late presentations of radiation arteritis. *Semin Vasc Surg* 2003;16:209-14.
4. Phillips GR 3rd, Peer RM, Upson JF, Ricotta JJ. Late complications of revascularization for radiation-induced arterial disease. *J Vasc Surg* 1992;16:921-4; discussion: 924-5.
5. Neisen MJ. Endovascular management of aortoiliac occlusive disease. *Semin Intervent Radiol* 2009;26:296-302.

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