A hybrid approach to persistent sciatic artery fusiform aneurysm repair

Min H. Choi, MD,[a] Turna J. Mukherjee, MD,[a] Cuepil Choi, BS,[b] Javairiah Fatima, MD,[a] *and* Cameron M. Akbari, MD,[c] *Washington, DC*

ABSTRACT

A persistent sciatic artery is a rare vascular anomaly that is prone to early atherosclerotic development and aneurysmal degeneration. Repair of the degenerative aneurysm is critical because it can lead to rupture, thrombosis, distal embolization, and sciatic nerve damage from compression. We report a case of a symptomatic unilateral persistent sciatic artery fusiform aneurysm that was treated using a simultaneous open surgical and endovascular approach. The patient underwent right common femoral to below-knee popliteal artery bypass and percutaneous endovascular embolization of the right sciatic artery aneurysm. Proper surgical intervention determined by the patient's comorbidities and unique anatomy achieved favorable outcomes. (J Vasc Surg Cases Innov Tech 2023;9:101280.)

Keywords: Aneurysm; Embolization; Endovascular repair; Open bypass; Sciatic artery

A persistent sciatic artery (PSA) is a congenital vascular anomaly occurring in ~0.05% of the population.[1] The sciatic artery is a branch of the umbilical artery that supplies the lower limbs during the embryonic stage. In normal development, the distal sciatic artery regresses as perfusion is taken over by the superficial femoral artery.[2] In patients with PSA, the sciatic artery fails to involute. Pillet et al[3,4] described four types of PSA according to the anatomic patency between the PSA and superficial femoral artery. Gauffre et al[5] added a fifth type, with the PSA originating from the median sacral artery (Fig 1). Clinically, ≤48% of PSAs result in aneurysmal degeneration, potentially causing symptoms of intermittent claudication, a pulsatile buttock mass, compressive neuropathy, and rupture.[7,8] This case report illustrates a hybrid method of simultaneous open and endovascular repair of a fusiform PSA with aneurysmal degeneration with a favorable outcome. The patient provided written informed consent for the report of her case details and imaging studies.

CASE REPORT

A 69-year-old woman presented to our clinic with an incidental finding of a 3-cm right PSA with fusiform aneurysmal degeneration. The patient was advised to promptly obtain a dedicated computed tomography angiogram (CTA) of the aorta and runoff for surgical planning. However, she was lost to follow-up until 4 months later, when she became symptomatic with a complaint of 3 days of right flank and hip pain radiating to her groin. Her medical history included diabetes, hypertension, and liver transplantation for hepatic cirrhosis with tacrolimus therapy. On physical examination, she was morbidly obese with a body mass index of 36.4 kg/m^2. Her hemodynamics were normal, with bilateral palpable femoral, popliteal, dorsalis pedis, and posterior tibial artery pulses. She had no palpable pulsatile mass on the right buttock. She had no bruising, ecchymosis, or hematoma on the right hip. Her laboratory test results were unremarkable. The CTA at admission revealed a right PSA aneurysm measuring 4.1 cm in the maximal caliber with mural thrombus. The patent lumen of the PSA measured 18.6 mm in diameter (Fig 2). The PSA had increased in size from 3 cm compared with the prior CTA 4 months before. The right external iliac artery and common femoral artery (CFA) were patent; however, the right CFA was smaller in caliber (9.1 mm) than the left CFA (11.4 mm). Vein mapping revealed adequately sized bilateral saphenous veins but they were tortuous and became extrafascial and were, thus, unsuitable for a bypass conduit.

The patient was taken to the operating room for a hybrid approach with simultaneous femoral to below-knee popliteal artery bypass with percutaneous endovascular embolization of the right PSA aneurysm. The rationale for the procedure was to prevent rupture of the aneurysm, distal embolization, and relieve the symptoms of right hip pain. We deemed that open repair of the aneurysm would add considerable morbidity owing to the patient's morbidly obese body habitus. In addition, the aneurysm was located distal to the sciatic notch, which meant that a transgluteal approach would be required.

From the MedStar Heart and Vascular Institute, Department of Vascular Surgery, MedStar Washington Hospital Center[a]; the Georgetown University School of Medicine[b]; and the Department of Vascular Surgery, MedStar Georgetown University Hospital.[c]

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Correspondence: Min H. Choi, MD, MedStar Heart and Vascular Institute, Department of Vascular Surgery, MedStar Washington Hospital Center, 106 Irving St NW, PO Box N 3150, Washington, DC 20010 (e-mail: Min.h.choi@Medstar.net).

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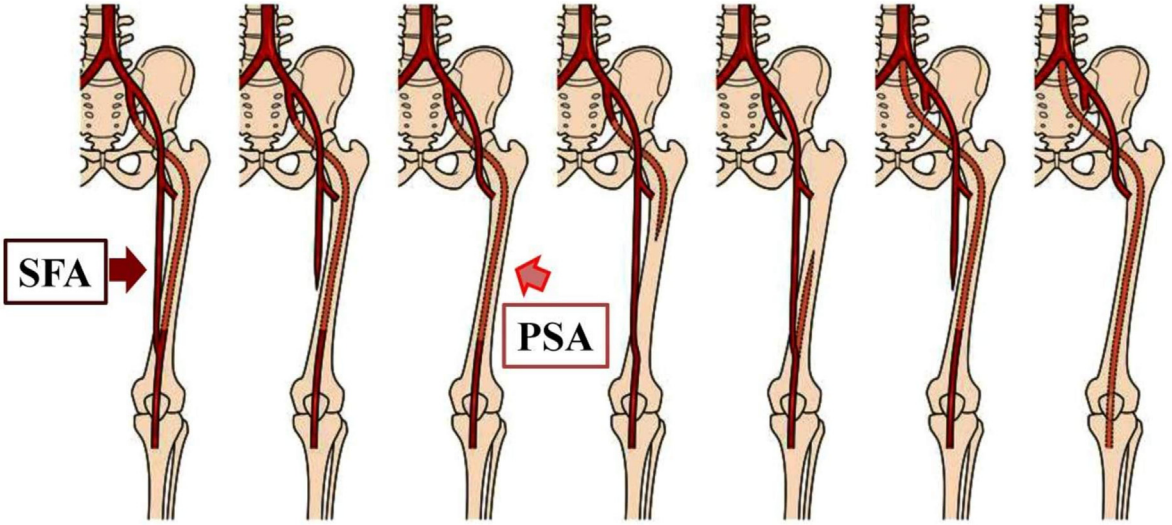

Type	1	2a	2b	3	4	5a	5b
PSA	complete			upper part	lower part	complete type from the MSA	
SFA	normal	incomplete	absent	normal		incomplete	absent

Fig 1. Classification of the sciatic artery aneurysm. Pillet et al[3,4] described four types of persistent sciatic artery (PSA): type 1, a complete sciatic artery runs along with a complete femoral artery; type 2, a complete sciatic artery runs with an incomplete or absent femoral artery; type 3, only the proximal sciatic artery persists with a normal femoral artery; and type 4, only the distal sciatic artery persists with a normal femoral artery. Gauffre et al[5] described a fifth type, where the PSA originates from the median sacral artery with either a developed or an underdeveloped superficial femoral artery (*SFA*). *MSA,* Median sacral artery. Reprinted, with permission, from Fukuda et al.[6]

First, the right CFA to below-knee popliteal artery bypass with an 8-mm ringed polytetrafluoroethylene graft was performed in a usual fashion to maintain perfusion to the left lower extremity. Next, the left CFA was accessed using the Seldinger technique. The right PSA was selectively catheterized and embolized with two 14-mm Amplatzer plugs (Abbott Vascular) deployed proximally and distally to the aneurysm, with careful attention to avoid bony prominences (Fig 3). The flow through the PSA aneurysm was excluded, and the patient had palpable pedal pulses postoperatively. To reduce the risk of graft infection, a right sartorius muscle flap was placed by plastic surgery because the patient had poor tissue quality secondary to her longstanding immunosuppressive medication and diabetes. The patient's recovery was uneventful, and her right hip pain resolved. She was discharged on postoperative day 4 with aspirin and clopidogrel that was initiated after surgery. The ankle brachial index at 4 weeks of follow-up was 1.2 on right lower extremity, and arterial duplex ultrasound showed a patent bypass. The 3-month follow-up CTA revealed an excluded right PSA aneurysm, a regressed sac aneurysm to 1.91 cm in diameter, and a patent bypass graft (Fig 4).

DISCUSSION

The PSA was first described by Green[9] in 1832; he reported it as "a new variety of the femoral artery." The prevalence of PSA is rare, and the cause of the anomaly is unknown. The PSA is a continuation of the internal iliac artery and can act as the dominant vessel perfusing the lower limb.[10] Because there are anatomic variations of the PSA, the entire dedicated lower extremity arterial anatomy must be reviewed before surgical planning. In the present case, the patient had a type 2a PSA. Without proper revascularization to the distal arteries, ligating or embolizing the PSA would be detrimental to the blood flow to the lower leg. Surgical planning must be correlated with the anatomic variations of the sciatic artery aneurysm. If patients with PSA have no symptoms or aneurysmal degeneration, intervention might not be

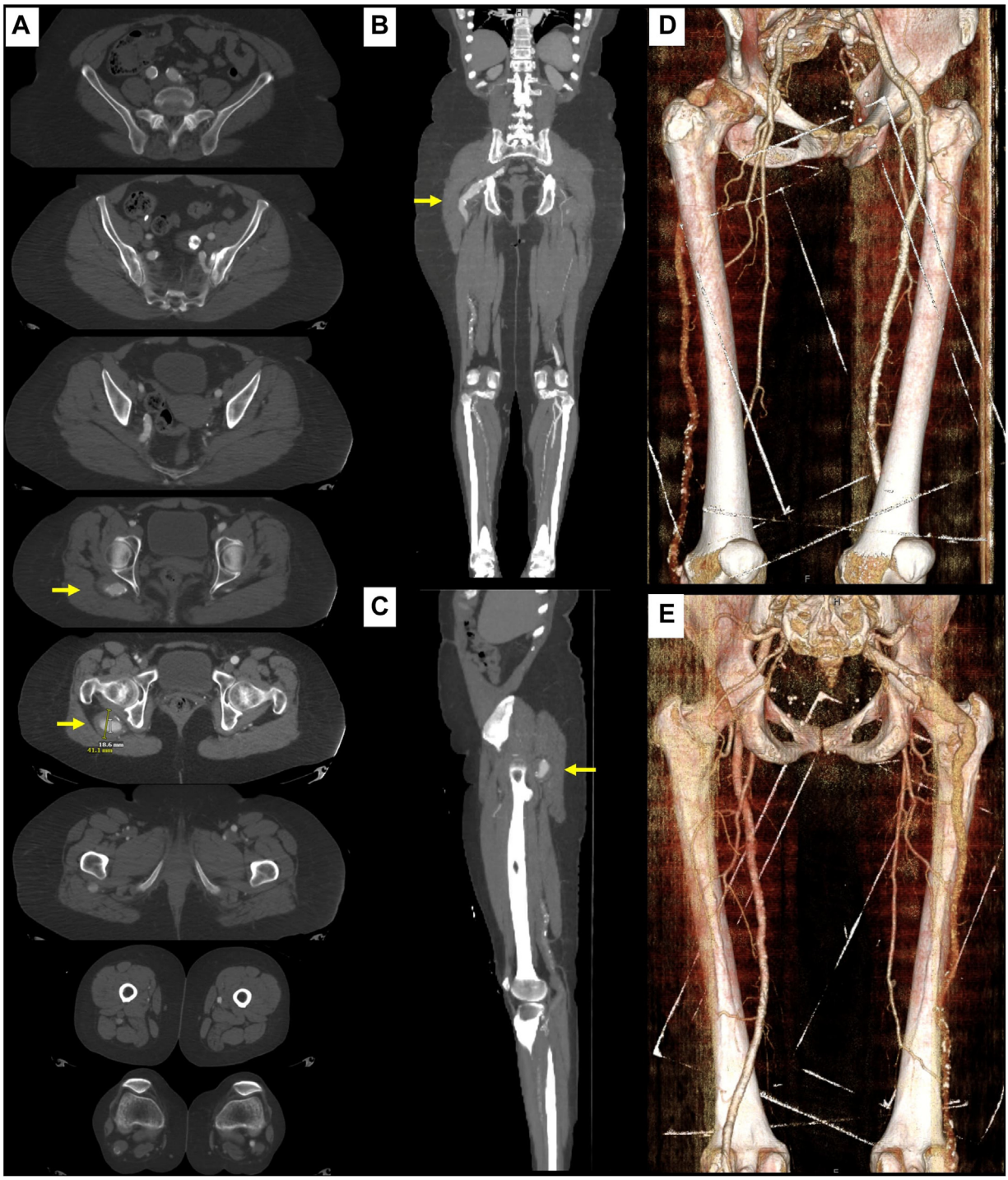

Fig 2. Computed tomography angiogram (CTA) of the aorta with runoff showing a right persistent sciatic artery (PSA) fusiform aneurysm with degeneration (*yellow arrow*) and mural thrombus. The maximal diameter of the right PSA aneurysm measured 4.1 cm with a patent lumen measuring 1.9 cm. The right external iliac, common femoral, and profunda arteries were patent. The right common femoral artery (9.1 mm) was smaller in caliber than the left common femoral artery (11.4 mm). The right superficial femoral artery was hypoplastic but was patent to the level of the lower thigh. The right sciatic artery was in continuity with the popliteal artery. **A,** Axial views of multiple cross-sectional levels. **B,** Coronal view. **C,** Sagittal view. **D,** Three-dimensional reconstruction of anterior view. **E,** Three-dimensional reconstruction of posterior view.

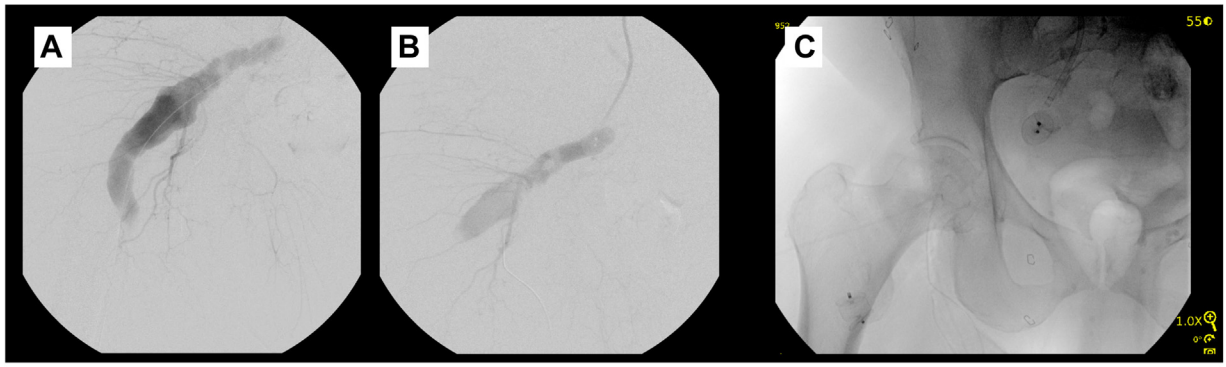

Fig 3. Fluoroscopy of the right persistent sciatic artery (PSA) aneurysm. **A,** Before embolization. **B,** After embolization with Amplatzer plugs demonstrating reduced flow to the aneurysm sac. **C,** Fluoroscopic image of two 14-mm Amplatzer plugs deployed proximally and distally to the sciatic artery aneurysm. Care was taken to deploy the proximal Amplatzer plug at the level of the pelvis and the distal Amplatzer plug at the level of the proximal thigh to avoid placing the plugs in close contact with the sciatic nerve.

necessary.[11] However, they must be followed up with physical examinations and imaging studies for continued surveillance. A PSA should be urgently repaired if aneurysmal degeneration, sciatic nerve injury, or a thromboembolic event causing acute limb ischemia.[12] If the PSA is incomplete, it can be simply ligated or embolized. Because of the rarity of PSA aneurysms, to the best of our knowledge, no literature is available regarding the size threshold indicating the need for repair. However, because PSA is an embryologic remnant of the iliac artery, we propose repair in accordance with the guidelines for iliac artery aneurysms at an aneurysm size of 3.5 cm, although further investigation and long-term follow-up are warranted.

Several cases have been in the literature regarding PSA management. Open repair of the ruptured PSA aneurysm with ligation and excision has been described by Ishida et al.[13] This approach, however, carries a high risk of nerve injury owing to the close proximity of the sciatic nerve in relationship to the PSA. Injury to the sciatic nerve can result in foot drop or weakness to the lower extremity.[13] Fukuda et al[6] repaired the PSA with an Excluder contralateral leg endoprosthesis (W.L. Gore & Associates). They demonstrated a favorable outcome with a reduction in the PSA aneurysm sac volume and stent graft patency of 12 months after intervention.[6] However, the long-term patency of the stent graft for PSA aneurysm repair might vary owing to extrinsic factors because patients sitting or bending their legs that could lead to graft dislodgment or compression.

de Boer et al[14] described a hybrid approach to PSA repair similar to that used in our case. They used femoropopliteal bypass with Amplatzer plug occlusion of the aneurysm. They resected the aneurysm because of its large size with a maximum 8 cm in diameter for the patient's comfort.[14] However, we did not resect the aneurysm, thereby eliminating the risk of possible nerve damage and subsequent morbidity. In addition, our patient avoided the possible complications from a wound infection because she was a high-risk patient with obesity, prolonged immunosuppressant use, and diabetes. We demonstrated a safe and effective surgical repair, leading to sac regression with symptom relief and the prevention of the morbidity and mortality associated with the natural disease progression of sciatic artery aneurysms.

CONCLUSIONS

This case report demonstrates management of a symptomatic PSA fusiform aneurysm with degeneration. A unique hybrid surgical method of incorporating both open femoral to below-knee popliteal bypass and endovascular embolization of the sciatic artery aneurysm minimized patient morbidity and achieved a favorable outcome.

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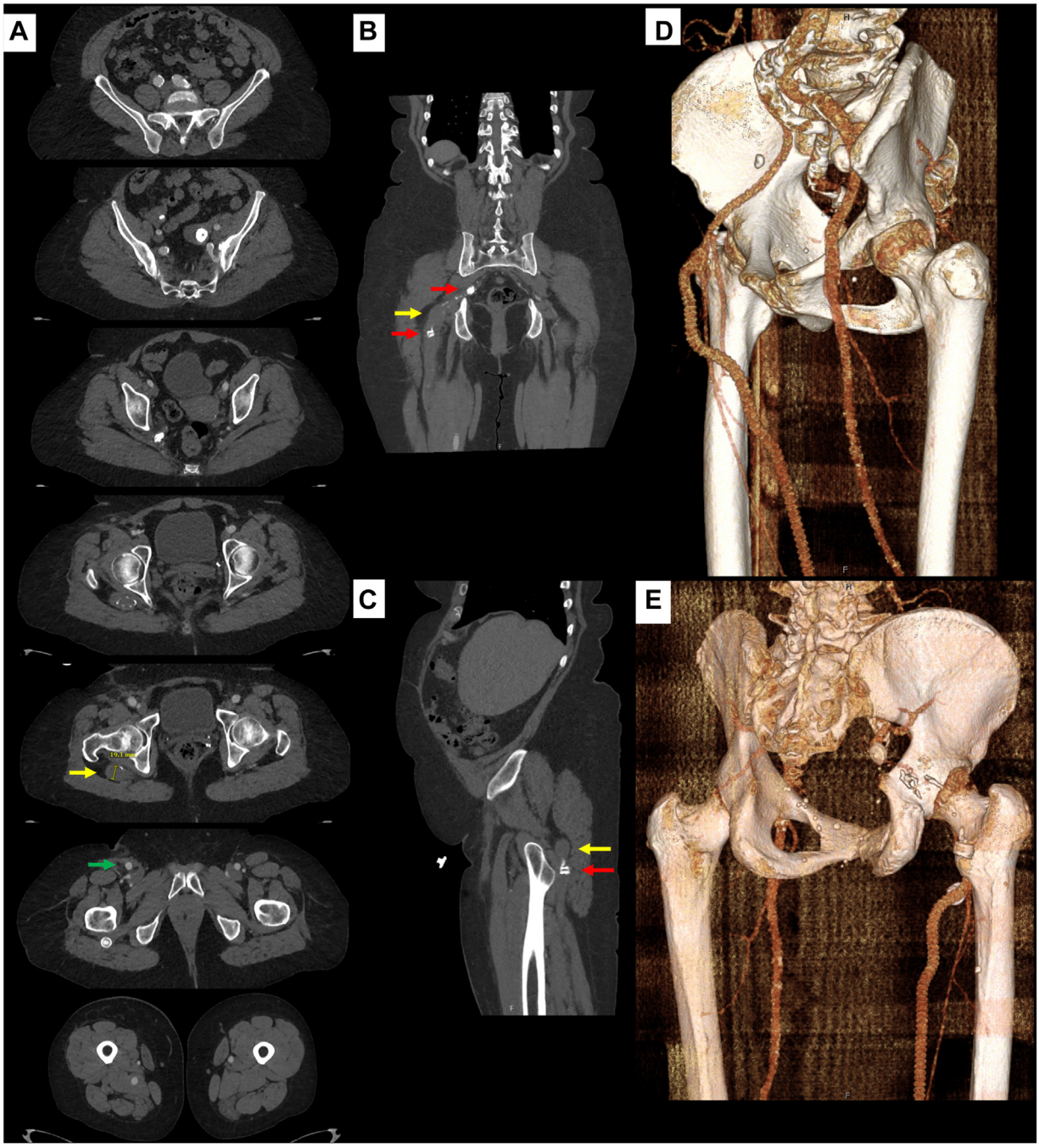

Fig 4. Computed tomography angiogram (CTA) of the abdomen and pelvis from the 3-month follow-up showing successful exclusion of the right persistent sciatic artery (PSA) fusiform aneurysm (*yellow arrows*) and two Amplatzer plugs (*red arrows*) located proximally and distally to the excluded sciatic artery aneurysm, with a patent common femoral artery (CFA) to below-knee popliteal polytetrafluoroethylene bypass (*green arrow*). **A,** Axial views of multiple cross-sectional levels showing excluded sciatic artery fusiform aneurysm measuring 1.9 cm in maximal diameter. **B,** Coronal view. **C,** Sagittal view. **D,** Three-dimensional reconstruction of left anterior oblique view. **E,** Three-dimensional reconstruction of posterior view.

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