Total endovascular repair for a persistent sciatic artery aneurysm with widespread limb-threatening arterial occlusion

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ABSTRACT

In the present report, we have described the case of a 79-year-old woman who presented with acute right lower limb ischemia and was diagnosed with bilateral persistent sciatic arteries and a right persistent sciatic artery aneurysm. Concomitant widespread thrombotic occlusion was present, extending from the orifice of the right internal and external iliac arteries to the below-the-knee popliteal artery. These complicated lesions were successfully treated using only percutaneous endovascular procedures, including stent-graft placement, bare metal stent implantation, and thrombolysis. Our report illustrates how a combination of techniques can achieve total endovascular repair of a persistent sciatic artery aneurysm accompanied by occlusion of the internal and external iliac arteries. (J Vasc Surg Cases and Innovative Techniques 2021;7:128-32.)

Keywords: Aneurysm; Endovascular treatment; Persistent sciatic artery; Stent-graft; Thrombolysis

A persistent sciatic artery (PSA) is a connection between the internal iliac artery (IIA) and popliteal artery. It is an embryologic remnant of the internal iliac artery occurring during early embryonic development. A PSA occurs in ~0.01% to 0.06% of the population and can cause sciatica neuralgia, aneurysmal formation (PSA aneurysm [PSAA]), and/or thrombotic occlusion.1-6 In addition to surgical bypass and/or resection, endovascular treatment (EVT), including stent-graft deployment, thrombolysis, and/or embolization, has recently emerged as a key treatment option.2,6-12

In the present report, we have described the successful management of a case of a PSAA with thrombotic occlusion extending from the orifice of the IIA and external iliac artery (EIA) to the below-the-knee popliteal artery. The PSAA was repaired using only EVT, including stent-grafts, a bare metal stent (BMS), and thrombolytic agents via a bidirectional percutaneous approach. The patient provided written informed consent for the report of her case.

Fig 1. Initial three-dimensional computed tomography angiogram showing a bilateral persistent sciatic artery (PSA). Continuous thrombotic occlusion is observed extending from the orifice of the right internal iliac artery (IIA, arrow) to the end of the PSA aneurysm (PSAA, arrowhead) and extending from the orifice of the external iliac artery (EIA) to the proximal part of the deep femoral artery. Intermittent thrombosis is observed extending from the distal end of the PSAA to the below-the-knee popliteal artery.
CASE REPORT

At a rehabilitation session for rheumatoid arthritis, a 79-year-old woman complained of a sudden severe pain in her right leg with pulselessness, pallor, and paresthesia of the limb. The laboratory examination results were as follows: myoglobin, 139.1 ng/mL; creatine kinase, 92 IU/L; and D-dimer, 46.2 μg/mL. Contrast-enhanced computed tomography (CE-CT) showed bilateral PSAs with the absence of superficial femoral arteries and a right PSA measuring 32 mm in diameter in the proximal femoral segment of the PSA (Fig 1). Continuous thrombotic occlusion was observed that extended from the right IIA orifice to the end of the PSAA. In addition, intermittent thrombosis was seen, extending from the distal part of the PSAA to the below-the-knee popliteal artery. The right EIA orifice was also occluded. A limb-threatening condition was considered present, requiring emergency repair. Because surgical bypass would have been inadequate owing to the lack of a run-off site resulting from the distal thrombus, EVT was performed.

EVT PROCEDURE

First EVT session. With the patient under local anesthesia, the access route was achieved percutaneously via the left deep femoral artery using ultrasound guidance. A 10F sheath and 8F sheath (Supersheath; Medikit, Gifu, Japan), a 6F guiding sheath (Destination; Terumo, Tokyo, Japan), and a 4F cobra catheter (Seiya; Medikit) were coaxially advanced antegradely into the right PSA through the thrombosed IIA using a 0.035-in. guidewire (Radifocus; Terumo). Crossing over to the distal part of the PSAA was impeded by the huge thrombus within the aneurysm. Therefore, retrograde access was achieved percutaneously via puncture of the PSA of the lower thigh using radiographic guidance. Next, a 4F sheath (Supersheath; Medikit) was inserted into the distal part of the PSAA (Fig 2, a). A 0.035-in. guidewire (Radifocus; Terumo) could retrogradely pass through the PSAA and was advanced into the IIA, and a pull-through technique was established with the antegrade system (Fig 2, b). The following maneuvers were applied in antegrade fashion: the thrombus within the range of motion in the gluteal segment of the PSA was reduced by manual aspiration thrombectomy and balloon angioplasty. Next, a BMS 10 mm in diameter and 10 cm in length (Epic; Boston Scientific, Boston, Mass) was deployed in the IIA (Fig 2, c). Two stent grafts (8 mm in diameter and 15 cm in length in the distal part and 9 mm in diameter and 15 cm in length in the proximal part; VIABAHN, Gore Medical, Newark, Del) were then deployed into the proximal neck of the PSAA up to the end of the femoral segment of the PSA (Fig 3, a), and the retrogradely inserted sheath was removed. A large thrombus was also observed within the popliteal artery and was fragmented using a balloon.
catheter measuring 6 mm in diameter and 15 cm in length (Mustang; Boston Scientific; Fig 3, b). Thromboses of the popliteal artery remained. Therefore, in the intensive care unit, continuous intra-arterial infusion of urokinase was administered through the catheter, which had been advanced into the stent-graft via the left brachial access route. After 24 hours of urokinase infusion (a total of 24 million units), cyanosis had reduced markedly. However, the patient remained hospitalized for rehabilitation.

**Second EVT session.** At 7 days after the first EVT session, a CE-CT scan revealed significant stenosis within the proximal part of the stent-graft resulting from thrombus fragmentation (Fig 4, a). Therefore, a second session was initiated. With the patient in the prone position, the gluteal segment of the right PSA was punctured, and a 6F sheath (Supersheath; Medikit) was inserted. A BMS measuring 8 mm in diameter and 4 cm in length (Inova; Boston Scientific) was deployed at the level of the thrombus (Fig 4, b). Resolution of the stenosis was achieved, with good blood flow (Fig 4, c).

**Follow-up findings.** Although the right ankle brachial index had improved to 1.15, motor impairment to the anterior tibial muscle persisted owing to an ischemic injury. At 16 days after the first EVT session, the patient was transferred to the original hospital to continue rehabilitation. Within 3 months, the patient was able to walk unaided. Patency of the treated arteries and size reduction of the PSAA were confirmed by follow-up CE-CT (Fig 5). No symptoms had recurred during the next 20 months.

**DISCUSSION**

PSAA, often caused by possible fragility of blood vessel walls and repetitive mechanical compression, occurs in 14.3% to 50.7% of patients with a PSA. Arterial occlusion occurs in 9.0% to 41.7% of PSA cases and frequently coexists with PSAA.
The anatomic classification of PSA, presence of a PSAA, and location and length of occlusions are important factors to consider during treatment. Most PSA cases will demonstrate partial or continuous occlusion between the gluteal segment of the PSA and the below-the-knee arteries. We search the reported data and found no previously reported cases of continuous thrombotic lesions that extended from the IIA orifice to the below-the-knee arteries. In such cases, the EIA running to the deep femoral artery could develop as a collateral pathway into the popliteal artery. However, the EIA in the present patient was also thrombosed, and a potential risk of limb loss was high. To the best of our knowledge, simultaneous occlusion of the EIA has not been reported previously.

Various EVT techniques depending on the lesion segments of the PSA were performed. The intrapelvic IIA segment was treated with thrombectomy and BMS implantation, the gluteal segment was treated using thrombectomy, the femoral segment that included the aneurysm was managed using stent-grafts, and the popliteal artery was treated using balloon angioplasty and thrombolysis. Access was achieved bidirectionally via the opposite deep femoral artery and the distal femoral segment of the PSA in the first session. Access was then achieved in antegrade fashion by direct puncture of the gluteal segment of the PSA in the second session. Each technique worked adequately, and complete revascularization was achieved throughout the right limb.

**CONCLUSIONS**

The combination of EVT techniques performed was an effective therapeutic option for a PSAA with a...
widespread and complicated thrombotic arterial occlusion and assisted in successfully achieving total endovascular repair.

REFERENCES

1. Green PH. On a new variety of the femoral artery: with observations. Lancet 1832;17:730-1.
2. van Hooft IM, Zeebregts CJ, van Sterkenburg SM, de Vries WR, Reijnen MM. The persistent sciatic artery. Eur J Vasc Endovasc Surg 2009;37:585-91.
3. Brantley SK, Rigdon EE, Raju S. Persistent sciatic artery: embryology, pathology, and treatment. J Vasc Surg 1993;18:242-8.
4. Ikezawa T, Naiki K, Moriura S, Ikeda S, Hirai M. Aneurysm of bilateral persistent sciatic arteries with ischemic complications: case report and review of the world literature. J Vasc Surg 1994;20:96-103.
5. Ahn S, Min SK, Min SI, Ha J, Jung IM, Kim SJ, et al. Treatment strategy for persistent sciatic artery and novel classification reflecting anatomic status. Eur J Vasc Endovasc Surg 2016;52:360-9.
6. Gabelmann A, Krämer SC, Wisianowski C, Tomczak R, Pamler R, Görich J. Endovascular interventions on persistent sciatic arteries. J Endovasc Ther 2001;8:622-8.
7. Sato H, Nakai M, Sato M, Ikoma A, Nishimura Y. Retrograde popliteal endovascular stent-graft repair for a growing persistent sciatic artery aneurysm (type IIA): case report and review of the literature. J Vasc Interv Radiol 2014;25:1997-2000.
8. Fukuda H, Onitsuka S, Yoshida S, Hirata Y, Hiromatsu S, Tanaka H. Endovascular stent-graft repair of a persistent sciatic artery aneurysm. Ann Vasc Dis 2017;10:246-9.
9. Wang Y, Xin H, Tan H, Wang H. Endovascular stent graft repair of complete persistent sciatic artery aneurysm with lower limb ischemia: a case report and review of the literature. SAGE Open Med Case Rep 2019;7. 2050313x19841462.
10. Inui TS, Picel AC, Barleben A, Lane JS. Endovascular management of a large persistent sciatic artery aneurysm. Ann Vasc Surg 2018;52:312.e13-6.
11. Nuño-Escobar C, Pérez-Durán MA, Ramos-López R, Hernández-Chávez C, Llamas-Macias F, Baltazar-Flores M, et al. Persistent sciatic artery aneurysm. Ann Vasc Surg 2013;27:1182.e13-6.
12. Sugihara R, Ueda Y, Nishimoto Y, Takahashi K, Nakano T, Higuchi Y, et al. Angioplasty of the occluded persistent sciatic artery using the retrograde approach from superficial femoral artery. Ann Vasc Surg 2017;42:229-30.e1-5.
13. Bower EB, Smullens SN, Parke WW. Clinical aspects of persistent sciatic artery: report of two cases and review of the literature. Surgery 1977;81:88-95.
14. Gauffre S, Lasjaunias P, Zerah M. Sciatic artery: a case, review of literature and attempt of systemization. Surg Radiol Anat 1994;16:105-9.
15. Kruse RR, Doornenkl DE, Maltha KV, Kooloo JCM, Kozic T, Reijnen MMPJ. Collateral artery pathways of the femoral and popliteal artery. J Surg Res 2017;211:45-52.

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