Unclassified unilateral persistent sciatic artery in a patient with chronic intermittent claudication

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ABSTRACT

Patients with persistent sciatic artery are at high risk for development of limb ischemia, aneurysm formation, and embolism. In this report, we identify a nonclassified left leg persistent sciatic artery in a patient with chronic limb ischemia. Vascular reconstruction was carried out by common iliac-deep femoral artery bypass to restore adequate arterial flow. Our approach to placement of the distal anastomosis on the deep femoral artery instead of on the popliteal artery, which is used in routine practice, may potentially increase treatment efficacy and decrease surgical complications. At 2-year follow-up, the patient remained asymptomatic and in good health. (J Vasc Surg Cases and Innovative Techniques 2019;5:379-83.)

Keywords: Persistent sciatic artery (PSA); Bypass; Patency

Persistent sciatic artery (PSA) is a rare vascular variation that can cause life-threatening complications.[1] This anomaly arises during embryonic development from failure in redirection of arterial flow from the sciatic artery to the superficial femoral artery (SFA), which normally takes over blood circulation in the lower limb starting from the third month of development.[2,3] The incidence of PSA is 0.025% to 0.04% in both men and women.[4] Pillet et al[5] classified four types of PSA and Gauffre et al[6] added a fifth type according to the origin of the arteries and the degree of completeness of the sciatic artery and SFA. Type 1 is a complete PSA and a fully developed SFA. Type 2 is a complete PSA with either partially developed SFA (subtype 2a) or absent SFA (subtype 2b). Type 3 and type 4 are incomplete PSAs in which only part of the sciatic artery remains; the proximal part persists in type 3, and the distal part persists in type 4. Both types have normal SFAs. Type 5 is a PSA originating from the median sacral artery and has two subtypes, fully developed SFA (type 5a) and partially developed SFA (type 5b).[1] In patients with PSA, unilateral occurrence of the complete type is most common.

Here, we report the case of a female patient with an unclassified unilateral PSA with accompanying chronic limb ischemia. Computed tomography angiography (CTA) revealed the internal iliac artery continuing into the sciatic artery distally toward the profunda femoris artery (PFA, deep femoral artery) and providing the main blood supply to the left leg. Total occlusion was found in the external iliac artery (EIA)-common femoral artery (CFA)-SFA-popliteal artery (PA). Revascularization was performed to repair the anatomic defect and to restore adequate blood supply to the left lower extremity. Clinical complications of and therapeutic approaches to the PSA were assessed to determine management and subsequent care of the patient.

CASE REPORT

A 40-year-old woman presented with chronic intermittent claudication on the left side for >10 years. She reported intense left leg muscle pain and fatigue when walking >150 feet. The symptoms were gradually relieved after resting for 10 minutes but reappeared when she resumed walking, eventually leading to numbness and coldness in her left foot. The patient denied any history of hypertension, hyperlipidemia, diabetes, and smoking. On physical examination, the patient had a lower skin temperature in her left foot than in her right. On palpation, the pulse of the left femoral artery as well as of the left PA was markedly diminished, and the pulse of the left dorsalis pedis-posterior tibial artery was absent. The ankle-brachial index (ABI) was 0.73 on the right and 0.38 on the left. After admission, CTA showed the presence of a PSA that originates from the internal iliac artery, runs through the greater sciatic foramen, and lies deep in the major gluteal muscle to go distally to the deep femoral artery (Video). Another abnormal artery also starts at the internal iliac artery and goes on the lateral side of the obturator internus in the pelvis, then runs through the obturator foramen and reaches the PFA directly. This course was similar to the obturator artery, but the normal obturator artery did not reach the PFA directly (Fig 1). There was also disruption of common iliac artery (CIA) blood flow to the EIA-SFA-PA course. The patient was diagnosed with left PSA. To restore blood flow to the left lower extremity, a left CIA-deep femoral artery bypass

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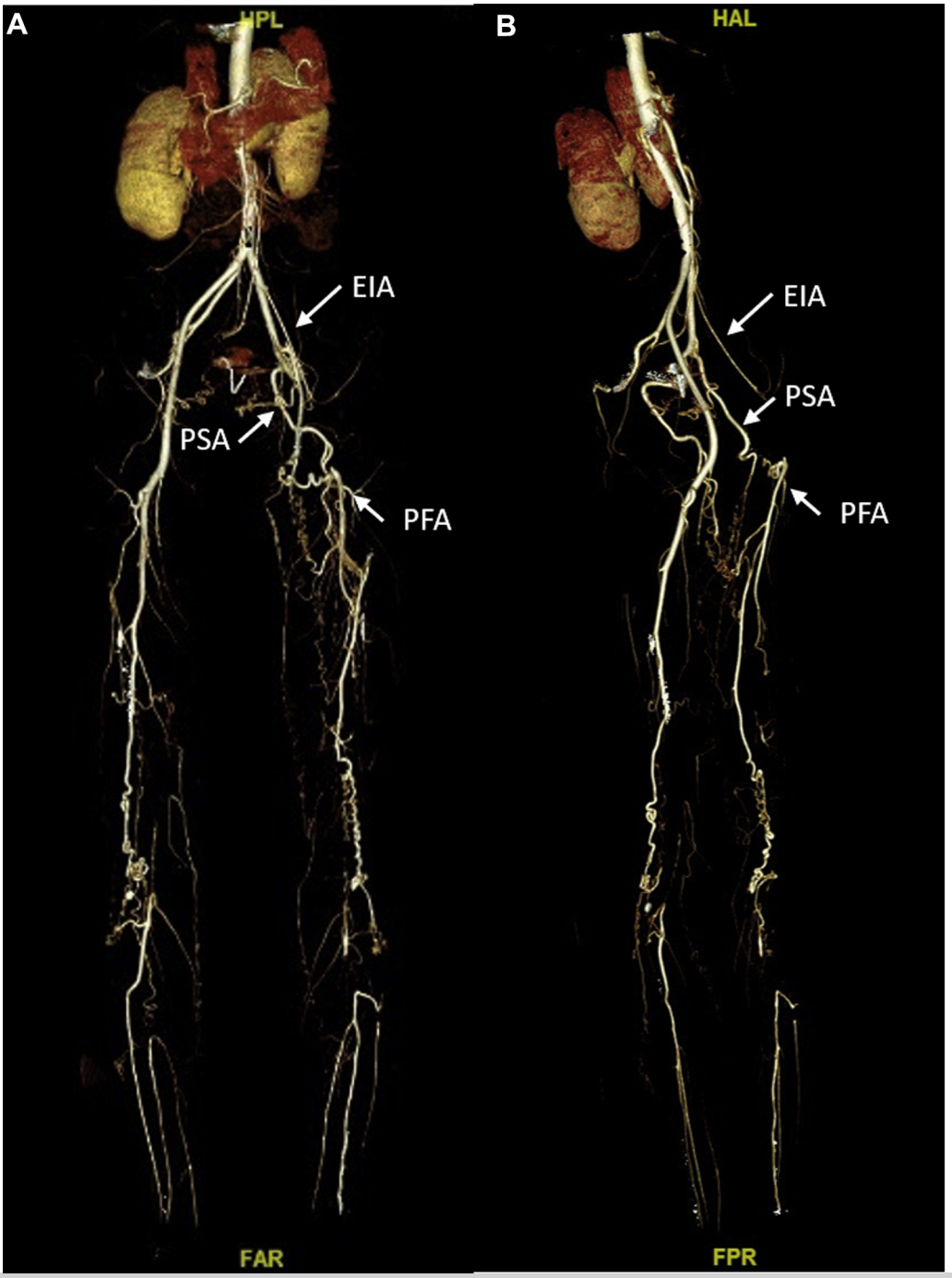

Fig 1. Preoperative computed tomography angiography (CTA) revealed that the left persistent sciatic artery (*PSA*) used collateral vessels feeding the left profunda femoris artery (*PFA*). The external iliac artery (*EIA*) was shrunken and occluded in the distal part. The common femoral artery (CFA), the superficial femoral artery (SFA), and the popliteal artery (PA) were totally occluded.

was performed with INTERING vascular graft (W. L. Gore & Associates, Flagstaff, Ariz). An incision in the left retroperitoneum was made to expose the CIA, which was used for proximal anastomosis (end to side). Another incision was made crossing the inguinal region to expose the CFA, SFA, and PFA, which was used for distal anastomosis (end to side; Fig 2). We did not identify any other anomalous artery in sight in the groin during the operation. The texture of the CFA and SFA was tougher and the caliber of both arteries was almost closed, smaller than normal artery, but we did not find atherosclerotic plaque in the arteries. Postoperative assessment with CTA showed good patency of the entire graft (Fig 3). ABI was 0.70 on the right

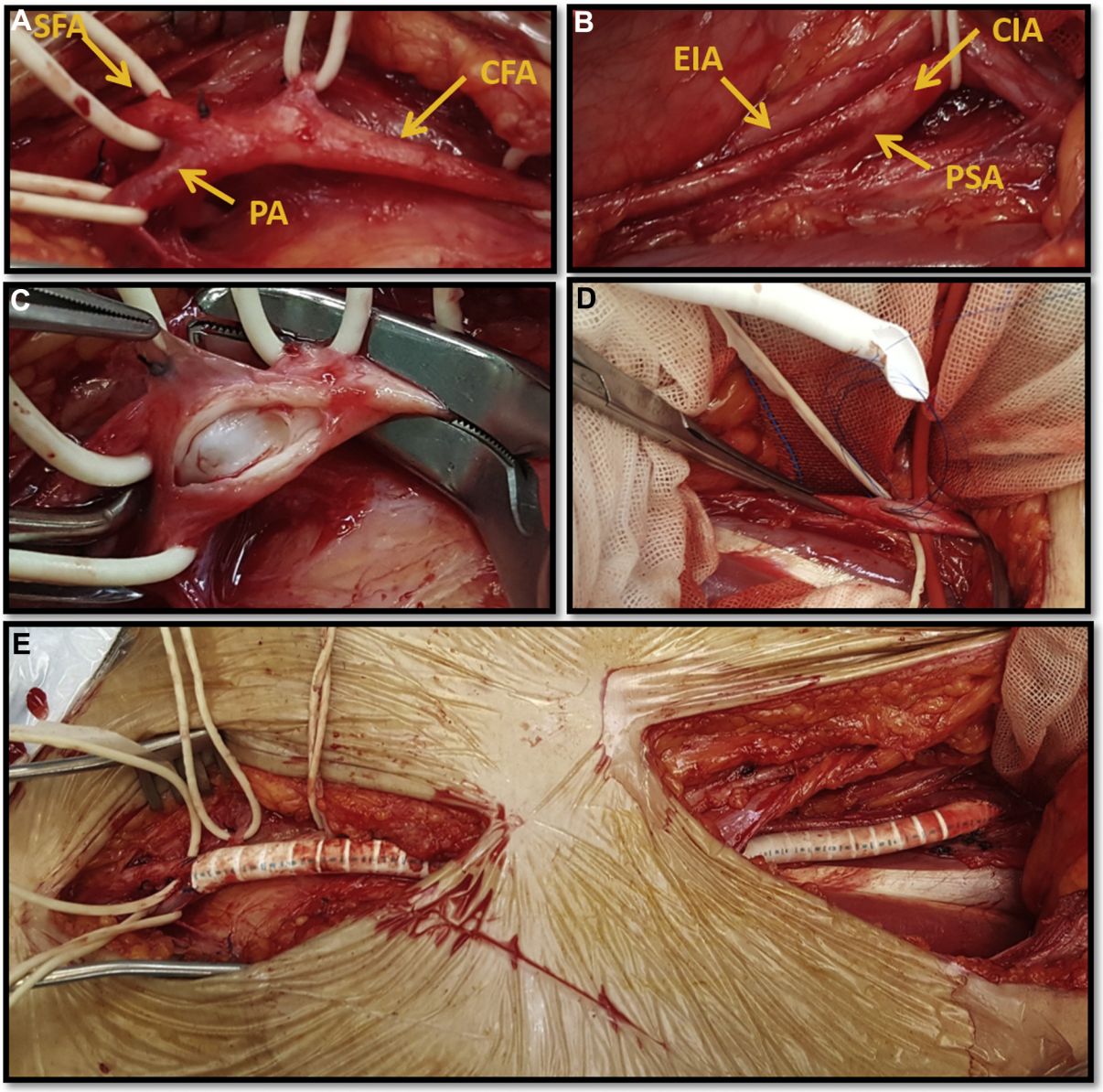

Fig 2. A and **B,** Intraoperative images show a shrunken external iliac artery (*EIA*) and occluded common femoral artery (*CFA*) and superficial femoral artery (*SFA*; *arrows*) of the left leg. The common iliac artery (*CIA*) and the profunda femoris artery (PFA) were patent (*arrows*), and their lumens remained intact. *PA*, Popliteal artery; *PSA*, persistent sciatic artery. **C** and **D,** CIA-PFA bypass with end-to-side anastomosis using expanded polytetrafluoroethylene vascular graft (INTERING; W. L. Gore & Associates) was performed. **E,** An operative image of CIA-PFA trunk bypass.

and 0.75 on the left after bypass surgery. The patient was followed up after the operation and had no symptoms at her 2-year visit.

All treatment protocols were conducted according to the Ninth People's Hospital guidelines and were approved by the review board. Informed consent was obtained from the patient.

DISCUSSION

The main artery of the lower limb is the SFA that starts from the EIA. Interruption of blood flow from the EIA to the SFA leads to arterial insufficiency and inadequate perfusion of the leg. The sciatic artery is a continuation of the internal iliac artery that delivers blood to the leg during early embryonic development; normally, blood supply to the lower limb is completely taken over by the SFA in the third month, and the sciatic artery regresses. PSA refers to the failure of the sciatic artery to regress and has significant variations in arterial patterns. Based on the Pillet-Gauffre classification, PSA is divided into five categories.[5,6] This classification follows the anatomic features of the PSA and SFA. To the authors' knowledge, no involvement of the deep femoral

Fig 3. Postoperative computed tomography angiography (CTA) demonstrated a patent common iliac artery (CIA)-profunda femoris artery (PFA) bypass graft.

artery in PSA has previously been reported or categorized. In consideration of the patient's medical history without diabetes, hyperlipidemia, immune diseases, and smoking, the lesion vessel is not the medium and small arteries as in Buerger disease, so we present the first case of a unilateral PSA in which the sciatic artery meets the deep femoral artery, which is responsible for supplying blood to the left lower extremity. This resulted in a lack of blood flow in the CFA-SFA conduit. A CIA-PFA bypass operation was performed for treatment of intermittent claudication of the lower extremities and correction of the arterial malformation on the sciatic-deep femoral artery. After the procedure, there was an increase in ABI and resolution of symptoms.

Our findings describe a novel anatomic variation of PSA with significant clinical manifestations. In our patient's case, physical function and quality of life were severely affected as the result of PSA-induced chronic limb ischemia. The compromised oxygen and nutrient delivery to the lower extremity led to intermittent claudication and skeletal muscle degeneration. If untreated, chronic ischemia could lead to fatal limb tissue damage and progression to critical limb ischemia with limited treatment options and high risk for limb amputation.[7,8]

Because of these complications, treatment approaches must be optimized to produce maximal clinical improvement. In our case, because the patient had an occluded CFA-SFA-PA, we decided to relieve vascular insufficiency with revascularization. When the SFA-PA conduit is occluded, the deep femoral artery becomes the dominant source of blood supply to maintain collateral circulation in the lower extremities.[9] The PFA was a

good compensation way to supply adequate blood flow to the lower limb because the patient was asymptomatic in the right limb with SFA and PA occlusion too. According to the CTA image, the PFA in the left limb was also well developed and considered to be a good outflow artery to supply adequate blood to relieve ischemia symptoms. It has been reported that graft length has a significant influence on primary patency as grafts >50 cm in length have an increased risk for loss of primary patency at 1 year compared with grafts <40 cm.[10] The short length of bypass could simplify the surgical procedure and may have a lower incidence of graft compression or circuitous bypass distortion, which also offers greater opportunity for reintervention.[11] Ito et al[12] also reported a PSA case with lower limb ischemia with CIA-PFA bypass that is symptom free during 9 months of follow-up. In consideration of the long length of CIA-PA bypass and the occlusion of SFA and PA in the left leg, we performed the CIA-PFA bypass to reroute blood flow through a remodeling conduit. The other advantage of this bypass in a deep place is that it may improve soft tissue coverage and reduce the chance of a wound complication that threatens the bypass, such as infection.[10] We placed distal anastomoses on the deep femoral artery instead of on the more commonly used PA, which may have improved treatment results potentially because of the shorter length of bypass and good compensation of PFA.

To relieve the symptoms of ischemia and to decrease amputation rate, we should pay attention to PSA management. First, proper selection of the method of operation is important. We should carefully assess the CTA image before operation and choose the inflow and outflow arteries of bypass to keep patent and to improve the symptoms as long as possible. We should take the length, diameter of bypass, and artery type into consideration. The artery with good connection of the collateral circulation system may be a good choice as the outflow artery. Second, lifestyle modification is also important for recovery; as Qiu et al[13] reported, a bilateral PSA patient is symptom free >5 years with lifestyle modification but no bypass or intervention. They believed acquired factors, such as long-term repetitive arterial trauma, to be the major reason for PSA complications. In our case, the use of PFA reduced the length of graft used, thereby avoiding potential complications, such as infection and reocclusion. Clinical assessment at the 2-year follow-up confirmed the beneficial outcomes of our approach as the patient showed no symptoms related to PSA.

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