Persistent sciatic artery

Radiologic features and patient management

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ABSTRACT

Persistent sciatic artery (PSA) represents the persistence of the sciatic vessel in adult life that is responsible for the major blood supply to the lower limb in early embryologic development. The incidence of PSA has been estimated as low as 0.025-0.04%. We present 2 cases of PSA, one of which was complicated by an aneurysm that led to a life-threatening hemorrhage.

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The sciatic artery, the embryonic axis artery, arises from the inferior gluteal artery. It may persist as the primary artery of the thigh and continue into the leg as the popliteal artery. The incidence of persistent sciatic artery (PSA) has been estimated as low as 0.025-0.04%.[1] Like other vessels; the sciatic artery is subject to vasculopathies affecting the arterial system. Particularly, besides a predisposition to atherosclerosis, aneurysm or distal embolization,[2-6] a tendency for aneurysm formation has been described in 14.3-44% of cases.[7] In this report, we present 2 cases of PSA with such vasculopathies, along with the findings of radiological imaging.

Case Report. Two patients with different complaints were referred for radiologic evaluation.

Patient One. A 44-year-old female presented with mild pain and numbness, which was present for 10 years in her lower extremity. Her physical examination revealed the absence of dorsalis pedis pulse with otherwise, normal findings. Doppler ultrasonography (US), magnetic resonance angiography (MRA), and digital subtraction angiography (DSA) (**Figures 1a & 1b**) were performed. Doppler US showed monophasic flow pattern in the superficial femoral artery. The MRA, performed with 3-dimensional time-of-flight (3D-TOF) using 1.5-T magnetic resonance imaging (MRI) system, revealed a PSA continuing with the popliteal artery (**Figure 1c**). The DSA confirmed these findings; there was a PSA on the left side, and the left internal iliac artery continued as PSA and anastomosed with the popliteal artery. The superficial femoral artery was hypoplastic and did not supply significant flow to the lower extremity. The main blood supply to the extremity was via the PSA. (**Figures 1a, 1d, & 1b**).

Patient 2. A 53-year-old female was referred to our hospital's emergency service due to severe bleeding after an operation in the right gluteal region. She had a soft pulsatile mass in her right buttock. The operation had been performed in another hospital based on MRI, which showed a mixed intensity

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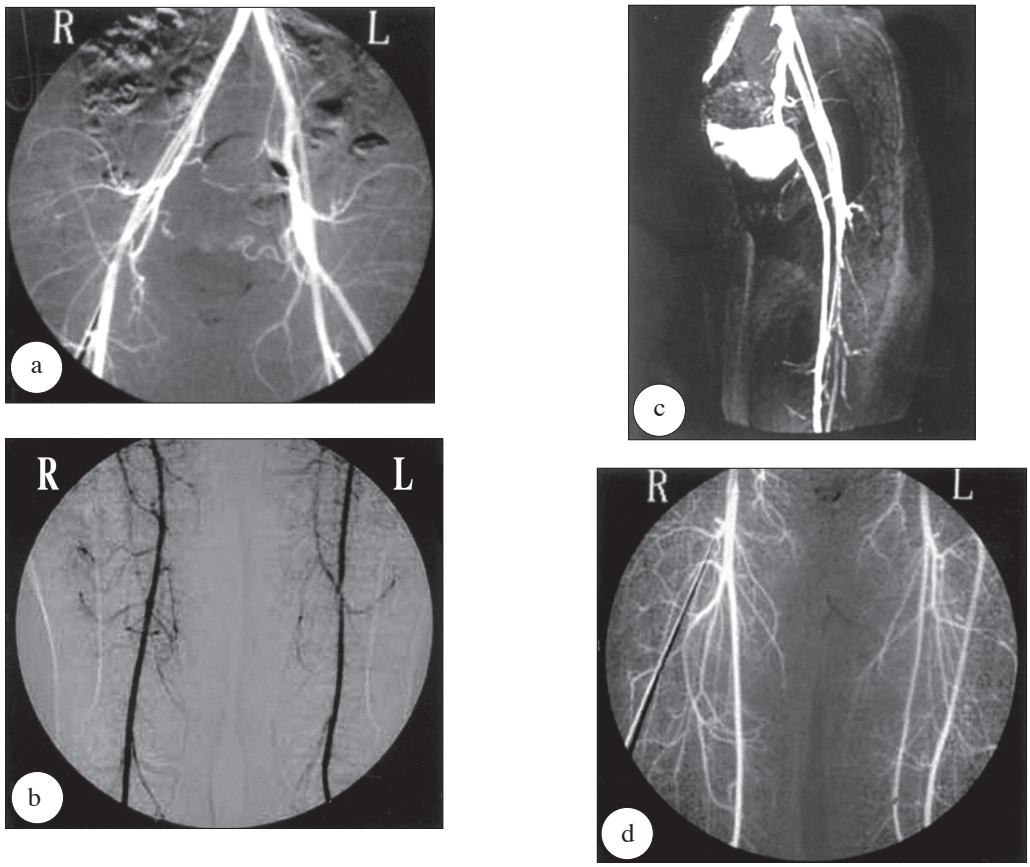

Figure 1 - Digital subtraction angiography and magnetic resonance angiography (MRA) of the first patient. **a)** Sciatic artery originates from the left internal iliac artery. **b)** Lying down lateral to the left hypoplastic superficial femoral artery. **c)** Persistent sciatic artery continues with the popliteal artery while superficial femoral artery gives off thin vascular channels. **d)** Anatomic orientation of the sciatic artery is more easily visualized on MRA.

mass. Doppler US, MRA and DSA were performed to clarify the situation. Doppler US revealed a heterogenous, semi-solid hypoechoic lesion in the gluteal region, which seemed to be a hematoma in the subcutaneous tissue. More deeply, there was an anechoic cystic lesion with an arterial flow pattern on Doppler US. Next to this lesion, there was a vascular structure, which demonstrated an arterial flow. These findings were consistent with an arterial aneurysm that ruptured and bled. The MRA, performed with 3D-TOF using 1.5-T MRI system, confirmed these findings and suggested that the lesion was probably a ruptured PSA aneurysm. The DSA revealed a right PSA with 2 aneurysm formations and occlusion of the distal PSA. The crural vessels opacified via collateral vascular channels. There was no superficial femoral artery on the right side (**Figures 2a, 2b & 2c**). After the diagnosis, ligation of IIA and iliopopliteal bypass graft operation was performed (**Figures 2d & 2e**).

Discussion. Phylogenetically, the sciatic artery is the earliest axial artery of the lower extremity in the human embryo, but it involutes in favor of the paired femoral arteries. Anatomically, it represents the prolongation of the inferior gluteal artery and accompanies the sciatic nerve from the level of the major sciatic foramen to the knee, where it contributes to the muscle-supplying vasculature or anastomoses with the vessels of the lower leg.[2,8] By the 22-mm embryo stage, the sciatic artery is replaced by the primitive femoral artery, which arises from the external iliac artery via capillary plexus and joins the sciatic artery in the region of the knee. If the femoral artery does not fully establish itself as the inflow to the lower extremities, persistence of the sciatic artery may be the result.[2,9] The PSA may be complete or incomplete. In the complete form of this anomaly, the sciatic artery is in continuity with the enlarged internal iliac artery and exits the pelvis through

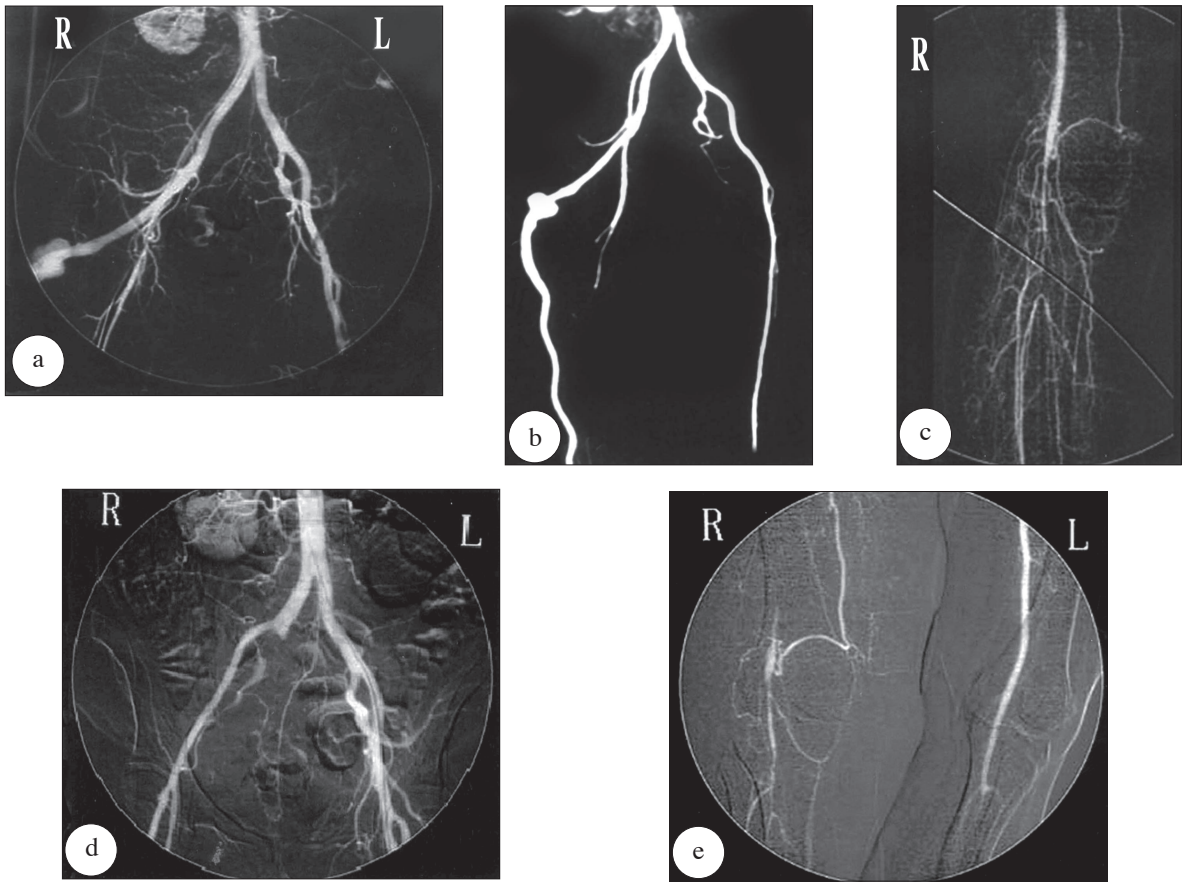

Figure 2 - Digital subtraction angiography and magnetic resonance angiography images of the second patient. **a) & b)** Right sciatic artery originates from the internal iliac artery while 2 aneurysm formations are seen in the gluteal region. Superficial femoral artery is not opacified. **c)** There is a distal embolism in the popliteal artery, and the crural circulation is maintained by the collateral vascular channels. **d)** After the internal iliac artery ligation and iliopopliteal graft operation were performed, the graft is well opacified. The internal iliac artery and the persistent sciatic artery are not visualized. **e)** The popliteal artery and distal crural vessels are opacified via the bypass graft.

the sciatic foramen below the piriformis muscle. It descends in the posterior thigh within or adjacent to the sheath of the sciatic nerve, and continues as the popliteal artery. The superficial femoral artery is often hypoplastic. The sciatic artery communicates with the branches of the superficial femoral, deep femoral, and popliteal arteries.[8,10,11] Traditionally, the diagnosis of PSA requires a lower extremity arteriography, although CT or MRI may establish diagnosis in certain cases.[8,9,11,12]

In PSA, there is a slight male predominance, and the average age of presentation is 49-year-old (range 6 months to 85 years).[13] Unfortunately, PSA is prone to early atherosclerotic degeneration and aneurysm formation in up to 44% of cases.[3,7] Aneurysms are characteristically located caudal to the sciatic notch as opposed to gluteal aneurysms that are cephalad to this landmark. Even if the exact cause of aneurysm formation is unclear, predisposing factors are a congenital hypoplastic vessel wall with reduced elastic elements and exposure of the artery to frequent and repeated trauma in the gluteal region.[1,2,14] Aneurysm of the PSA presenting as a pulsating mass in the buttock, as was the case in our second patient, may occur in approximately one third of the cases.[3,4,10,12,15] Arterial insufficiency as a result of thrombosis of the aneurysm or distal embolization of mural thrombus from the aneurysm are also common clinical presentations, and are associated with a high incidence of limb loss.[3,4,10,12,16] Other patients may experience sciatica manifested by pain, numbness or motor impairment, as a result, of compression of the sciatic nerve by the aneurysm at the level of the sciatic notch.[13] Although rare in occurrence, complications of PSA should be included in the differential diagnosis of sciatic neuropathy. The PSA

can be diagnosed with angiography, CT or MRI of the pelvis and lower extremities.[5,8,9,11] However, MRA may be considered the first line imaging modality due to its noninvasiveness and ability to generate 3-dimensional vascular images without using iodinated contrast.[9]

Our second patient had a very unusual presentation, with the iatrogenic rupture and intractable bleeding of the PSA aneurysm, which indicates the importance of considering the PSA aneurysm in the differential diagnosis of gluteal masses. Also, our patient represents the first case in the literature, presenting with the 2 important complications of the PSA, which are aneurysm formation and distal embolization. Earlier, surgery with femoropopliteal bypass and ligature of the sciatic artery was the treatment of choice in the management of PSA complications such as aneurysm formation and distal embolization. Such complications may also be amenable to interventional techniques, such as coil embolization and stent implantation. In recent years, there have been reports regarding successful non operative management of PSA aneurysm and distal embolization. Coil embolization, aneurysm exclusion with a stent-graft, balloon occlusion of PSA were some of the endovascular techniques used in the treatment.[6,12,17] In our second patient, internal iliac artery ligation and iliopopliteal graft operation were performed based on the decision of the referring physician.

In conclusion, PSA is a rare congenital vascular variation presenting with either nonspecific ischemic symptoms or severe symptoms due to complications such as aneurysm formation or distal embolization. Pulsatile masses on the buttocks must be carefully evaluated for the possibility of PSA aneurysm. Appropriate clinical and radiologic evaluation may be helpful for these patients to avoid unnecessary surgical procedures due to wrong diagnosis.

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