Popliteal artery entrapment by an enlarged sesamoid bone

Jun Suzuki, MD, Yoko Nemoto, MD, *and* Tatsu Nakazawa, MD, *Tokyo, Japan*

ABSTRACT

A 64-year-old woman came to our hospital because of intermittent claudication of her left leg. She had undergone meniscectomy of the left knee in her 30s. The ankle-brachial pressure index of the left leg was 0.70. Imaging examinations showed occlusion of the popliteal artery compressed by an enlarged sesamoid bone with osteophytes. No anatomic abnormalities of vessels and muscles were seen. A particular type of popliteal entrapment syndrome was diagnosed. After resection of the sesamoid bone, thromboendarterectomy and patch plasty were performed. After the operation, the claudication was improved, and the ankle-brachial pressure index of the left leg increased to 0.91. (J Vasc Surg Cases and Innovative Techniques 2019;5:210-3.)

Keywords: Popliteal artery; Entrapment; PES; Limb ischemia; Sesamoid

Popliteal entrapment syndrome (PES) often causes intermittent claudication in young patients who have little risk of arteriosclerosis. It results from abnormal anatomy of the popliteal fossa due to surrounding musculoskeletal structures.[1] The current classification of PES comprises types I to VI.[2] Types I to IV are classified by the positional relationship between the popliteal artery and the muscular bundle, type V is entrapment of the popliteal vein, and type VI is other variants.[2] PES-caused acquired changes have not been clearly described in the classification. Continuous compression of the popliteal artery causes obstructive changes in the popliteal artery or a popliteal aneurysm. The major symptom is intermittent claudication due to the arterial occlusion. Paresthesias and cold feet can also occur. In cases that deteriorate, critical limb ischemia can occur. Venous compression results in edema of the lower leg. Compression of the tibial nerve results in paralysis of plantar muscles and paresthesias of the foot. The treatment for PES is removal or cutting of the causative structure, and revascularization surgery is sometimes required in cases with arterial occlusion. These operations can improve the symptoms in most cases, and the prognosis of the leg is good, although there has been a case of limb loss.[2]

A case of PES due to compression by an enlarged sesamoid bone is described. The patient consented to publication of this report.

CASE REPORT

A 64-year-old woman came to our hospital because of intermittent claudication of the left leg. Her medical history included hypertension, hyperlipidemia, knee osteoarthritis, and a meniscus injury. She had undergone meniscectomy of the left knee when she was 30 years old. She was not a smoker. No arterial pulsation was palpable in the popliteal artery, dorsalis pedis artery, and posterior tibial artery of the left leg. Neither cyanosis nor an ischemic ulcer was seen in the foot. The ankle-brachial pressure index (ABPI) of the left leg was 0.70, and that of the right leg was 1.25. Electrocardiography showed no arrhythmias. A frontal radiograph of the left knee showed a narrowed joint and medial shift of the distal end of the femur, and the lateral view showed an enlarged sesamoid bone with osteophytes (Fig 1). Computed tomography (CT) and CT angiography showed occlusion of the left popliteal artery compressed by the sesamoid bone and a diffusely occlusive lesion of the distal artery, with intact arteries of the right leg (Fig 2). No anatomic abnormalities of the vessels and muscles were seen.

A particular type of PES was diagnosed because of the enlarged sesamoid bone with osteophytes. At surgery, the popliteal artery was exposed with a posterior approach (Fig 3, *a*). Except for the enlarged sesamoid bone, there were no anatomic abnormalities. The sesamoid bone was resected (Fig 3, *b*). Intimal hypertrophy and old thrombus were seen in the occlusive lesion of the popliteal artery. Thromboendarterectomy and patch plasty with a small saphenous vein were then performed (Fig 3, *c*). After the operation, the claudication was improved, and the ABPI of the left leg increased to 0.91. She has not had any symptoms for 3½ years after surgery.

DISCUSSION

In the classification of PES, types I to III PES result from compression of the popliteal artery by the temporary relationship between the artery and migration of the medial head of the gastrocnemius muscle. Type IV PES results from persistence of the axial artery as the mature distal popliteal artery. The artery is compressed by the popliteus muscle or fibrous bands. Type V is entrapment of both the popliteal artery and vein. Type VI is described as other variants in the report of Sinha et al.[2] Otherwise, it

From the Division of Vascular Surgery, Department of Surgery, Tokyo Metropolitan Geriatric Hospital.

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Correspondence: Jun Suzuki, MD, Division of Vascular Surgery, Department of Surgery, Tokyo Metropolitan Geriatric Hospital, 35-2 Sakaecho, Itabashi-ku, Tokyo 173-0015, Japan (e-mail: junsuzuki-tky@umin.net).

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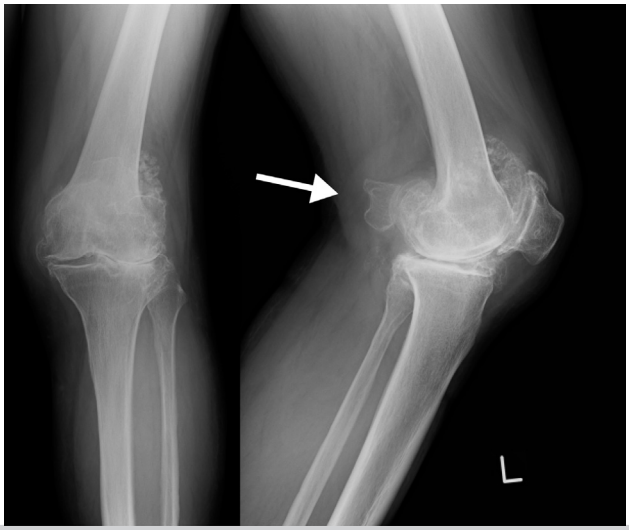

Fig 1. Preoperative radiograph. Frontal view of the knee shows the deformed knee joint. Lateral view shows the enlarged sesamoid bone with osteophytes (*arrow*).

Fig 2. Computed tomography (CT) and CT angiography. **a,** Cross-sectional image of preoperative enhanced CT scan. The popliteal artery (*arrow*) is compressed by the enlarged sesamoid bone with osteophytes. At this level, the contrast agent in the arterial lumen is seen. **b,** Preoperative CT angiography. The occlusion of the left popliteal artery is seen at the sesamoid bone with osteophytes. A diffuse defect of the arteries under the left knee is also seen. **c,** Postoperative CT angiography.

is also described as PES in the absence of an explanatory anatomic abnormality or functional type.[3] The definition of type VI does not specify that the variant must be congenital. In this case, no abnormal position of the muscles or vessels was seen. Therefore, this case was diagnosed as a particular type of PES caused by compression of the popliteal artery by an enlarged sesamoid bone with osteophytes. The claudication of this case occurred for the first time when she was 64 years old, which is older than the age when PES is likely to develop. For this reason, the anatomic abnormality was considered to be acquired, not congenital. It was caused by deformity of the knee joint with aging, meniscal surgery, and inflammation caused by the deformity. Although this case was diagnosed as a particular type of PES, if the current classification indicates congenital abnormalities, PES caused by acquired changes may have to be regarded as another type.

In an elderly patient with ischemic symptoms of the leg, arteriosclerosis obliterans is the most common disease. However, PES should also be suspected in a patient with deformity of the knee joint or an enlarged sesamoid on radiographic examination. Cross-sectional imaging such as CT can demonstrate the anatomic and positional

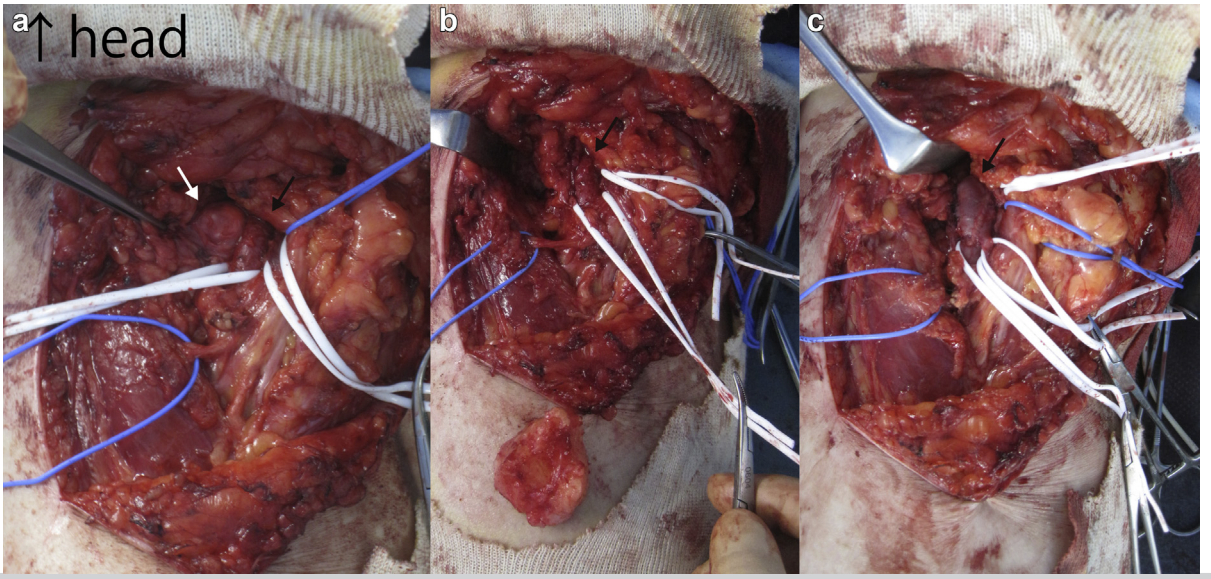

Fig 3. Intraoperative photographs. The *black arrow* indicates the popliteal artery, and the *white arrow* shows the sesamoid bone with osteophytes. **a,** The popliteal artery and the enlarged sesamoid bone are seen with the posterior approach. **b,** After resection of the sesamoid bone. **c,** Patch pasty of the popliteal artery is performed with the small saphenous vein after thromboendarterectomy.

relationships and may diagnose anatomic entrapment easily. A case with PES due to rheumatoid knee has also been reported.[4]

In this case, stenosis in the popliteal artery was caused by intimal hypertrophy that resulted from mechanical stimulation, like continuous or repeated compression by the enlarged sesamoid with osteophytes. Finally, thrombosis and occlusion occurred at the affected part. The pathologic change in this case was in agreement with the commonly reported changes seen in PES.[3] Aneurysmal change of the popliteal artery was not seen. Although the ABPI of the left leg after the operation did not improve to 1.0, it seemed that thrombus formation in the popliteal stenosis caused the occlusive change in the distal artery. In addition to contact between the artery and the sesamoid, relatively lateral displacement of the popliteal artery to the outside due to deformity of the knee was regarded as an associated factor.

A sesamoid bone, fabella, is a small bone found in the tendinous portion of the lateral head of the gastrocnemius muscle, frequently articulating directly with the lateral femoral condyle. The mean size is 7 mm $\times$ 5 mm $\times$ 6 mm.[5] The sesamoid bone helps the joint gain a biomechanical advantage by functioning as a pulley, reducing the friction of the tendons and potentiating the muscular pulling capacity. A sesamoid bone is not always present, with the reported incidence ranging between 8.7% and 31.3% in Western populations and 85.8% in Japanese populations.[5] The persistent presence and pressure of a sesamoid bone against the posterior aspect of the lateral femoral condyle under such circumstances might spur the development and ossification of the sesamoid.[6] Posterolateral knee pain and palsy of the common fibular nerve can be associated with the presence of a sesamoid bone. The pain that increases with extension of the knee, causing tension by pressing the sesamoid, may be referred to as fabella syndrome.[6] There is also a case report of peroneal nerve injury caused by an enlarged sesamoid bone.[7] A sesamoid bone $>$4 mm in size may cause symptoms, and excision of the bone is suggested when the bone is $>$10 mm in performing total knee replacement.[6]

CONCLUSIONS

A case of PES due to compression by an enlarged sesamoid bone with osteophytes was described. In a patient complaining of intermittent claudication with deformity of the knee joint or an enlarged sesamoid bone, popliteal artery entrapment, as in this case, should be considered.

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