

DIAGNOSIS AND SURGICAL TREATMENT OF A PERSISTENT SCIATIC ARTERY ANEURYSM

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The persistent sciatic artery is situated superficially in the gluteal region wherein it can be traumatized in normal daily activities: during a prolonged sitting position or while attempting to sit down. This leads to an early atherosclerotic lesion of the sciatic artery, to the development of aneurysmatic dilatation, and damage to the arterial wall. The present article describes a 72-year-old female patient presenting with a persistent sciatic artery of the left leg and a PSA aneurysm which consequently resulted in critical ischaemia of her left lower limb. This abnormality was detected during an examination and the woman was subjected to the operation of internal iliac-posterior tibial bypass grafting using an autologous vein with ligation of the sciatic artery. The bypass graft has been functioning for 5 months, with no events of critical ischaemia.

Key words: persistent sciatic artery aneurysm, critical ischaemia, internal iliac-posterior tibial bypass grafting, embryology of the arterial system of lower extremities.

INTRODUCTION

Persistent sciatic artery remains an infrequently encountered yet clinically important vascular problem. The first description of such an anomaly was published as early as 1832 in the Lancet [1]. The first description of aneurysm of the vessel, rupture of which resulted in the patients' death, was reported in 1864. Throughout the literature the incidence of PSA has been estimated to be as low as 0.025–0.04% [1]. According to the data of the embryologic development of the arterial system of the lower extremities, on the fourth week the right and left umbilical arteries returning blood to the placenta connect with the paired dorsal aortas in the sacral region. On week five, this communication is obliterated and the umbilical arteries connect with the proximal portion of the fifth lumbar dorsal segment of the artery, with the umbilical arteries in their turn developing to the common iliac arteries (CIAs). The internal iliac arteries (ICAs) originating form the ventral artery at the level of the fifth lumbar segment originate from the CIA and act as axial arteries to the lower extremities approximately up to the eighth week. The sciatic artery which travels posterior and parallel to the sciatic nerve is the axial artery for the lower limb. The sciatic artery is often considered to be the continuation of the ICA, but may originate from umbilical arteries. At the sixth week of gestation in the lower limb there develops the second arterial system. The external iliac artery (ECA) which also originates as a branch of the umbilical artery divides

from the CIA to form the iliofemoral system. In the lower portion of the femur, the sciatic artery connects with the iliofemoral system at the level of the popliteal fossa. By week eight, the iliofemoral system substitutes the system of the sciatic artery which in its turn nearly completely is obliterated. The only preserved portion of the sciatic artery is the portion of the internal iliac artery and its branches, inferior and superior gluteal artery. Soon after birth the umbilical arteries close. The proximal portions of the umbilical arteries are preserved as the main vesicular arteries and the distal portions form inguinal ligaments.

The popliteal artery (PA) develops from the union of two arteries: the deep PA which is a part of the system of the sciatic artery, and later on there develops the superficial PA. The distal portion of the deep PA regresses, whereas the superficial PA connects with the proximal portion of the deep PA with the formation of the mature PA lying posterior to the popliteal muscle (Fig. 1).

If the iliac-femoral arteries fail to develop the sciatic artery may persist as a dominant vessel of blood supply of the lower limb. This anomaly is classified into 2 clinical types – «complete», i. e. from the origin of the internal iliac artery to its connection with the PA, and «incomplete» one which is connected with the IIA or PA through small collaterals. An abnormally developed sciatic artery is anatomically located near the sciatic nerve and hence passes to the femur through the sciatic fossa and remains posterior to the abductor magnus muscle

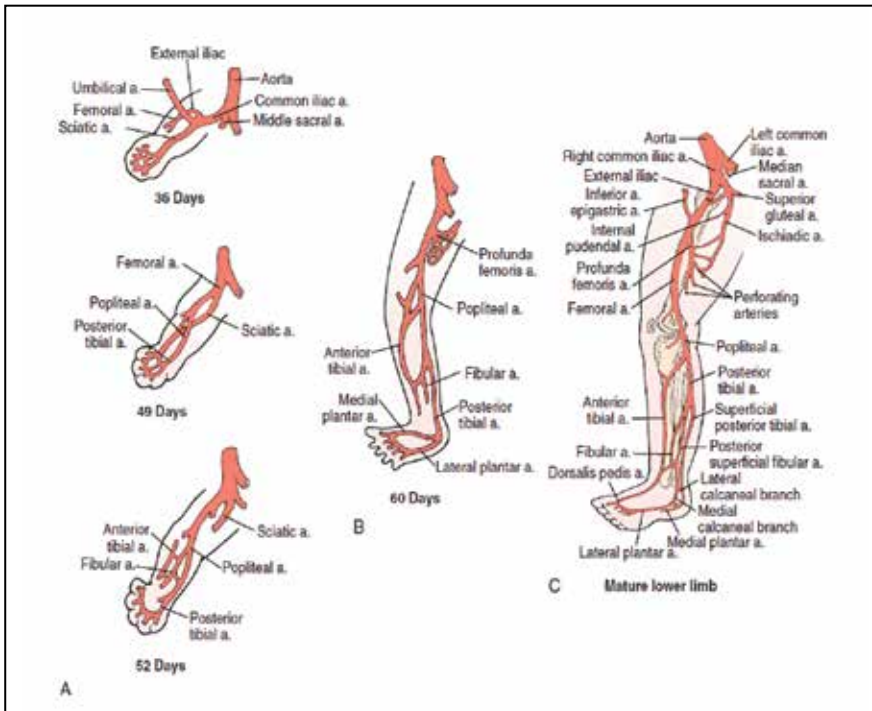


Fig. 1. Embryological development of the arterial system of the lower extremities [2]

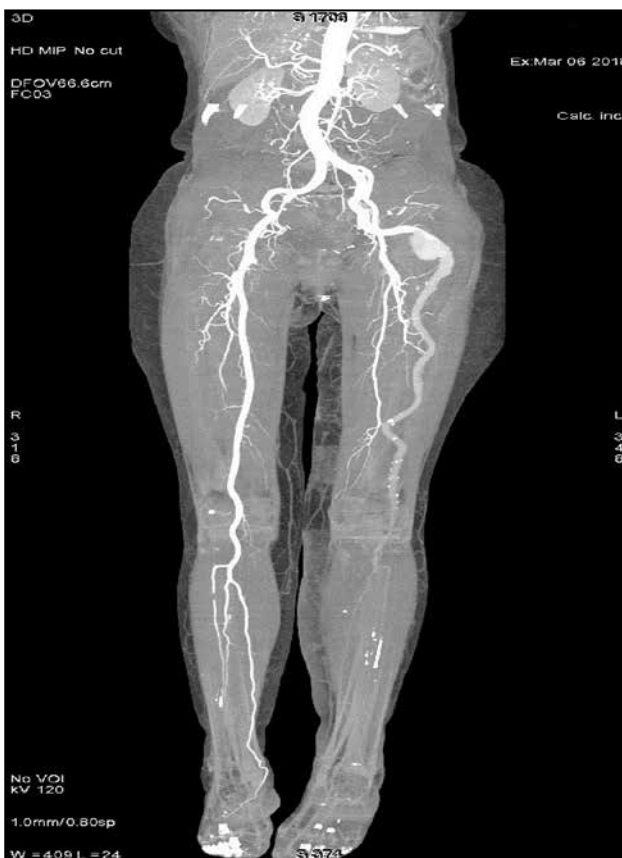


Fig. 2. RCT-angiogram of the aorta and arteries of lower limbs. Aneurysm of persistent sciatic artery and the artery itself in direct projection, as well as hypoplastic superficial femoral artery of the left leg

to the depression of the popliteal fascia, wherein it connects with the PA [2].

Clinical case

On July 1, 2018, admitted to the Emergency Department of the Interregional Clinical and Diagnostic Centre of the city of Kazan was a **72-year-old female** patient presenting with events of critical ischaemia of the left lower limb and complaints of pain in her leg at rest, and sleep disorders. Clear conscious, active position. On general examination respiration vesicular, no rales audible. Cardiac tones clear, rhythmic. Arterial pressure 130/80 mm Hg, heart rate – 72 b.p.m. St. localis: the left lower limb of physiological colour, cold hyperemia of the foot. On palpation of the femur

and crus the skin integuments are warm, however cold on the foot. Pulsation of the superficial femoral artery is weakened. Not determined distally. Movements and sensitivity preserved. The right lower limb is of the physiological colour, warm, with the pulsation of the major arteries preserved all along the length. Movements and sensitivity preserved, with no rales on auscultation heard.

USDS of the left limb arteries was performed, with the findings revealing thrombosis of the PA, tibial arteries on the left. The woman was hospitalised emergently with the diagnosis: «Subacute thrombosis of the popliteal, femoral arteries. State after femoropopliteal bypass grafting as of November 16, 2017 on the left. Bypass graft thrombosis, degree III chronic arterial insufficiency (CAI) of the left lower limb».

Studying her case history revealed the following: initial evidence of arterial insufficiency acutely occurring in June 2017. The woman was hospitalized to one of the medical facilities with the diagnosis: «Acute thrombosis of the superficial femoral artery and arteries of the foot of the left lower limb. Acute arterial insufficiency. Grade 1B acute arterial insufficiency». Conservative therapy was carried out.

In November, the symptoms repeated again. The woman was admitted to one of medical facilities, where on November 16, 2017 she underwent thrombectomy from the PA, posterior tibial artery (PTA) and anterior tibial artery, followed by femoral distal popliteal autovenous bypass grafting on the



Fig. 3. RCT-angiogram of the aorta and arteries of lower limbs. Aneurysm of persistent sciatic artery and the artery itself in oblique projection

left. Symptoms of CAI disappeared. According to the data of USDS as of November 17, 2017 the shunt was patent. Repeat deterioration of the state was reportedly observed since July 1, 2018 with the return of the clinical pattern of critical ischaemia.

During additional examination prior to reconstructive intervention she underwent computed tomography of lower limb arteries, revealing hypoplasia of the external iliac, common and deep femoral artery on the left. Post-thrombotic occlusion of the PA and tibial arteries on the left. Of interest was the presence of a persistent and fully functioning sciatic artery which in its turn continued to the PA. The common femoral artery terminated at the middle of the femur with small branches of the scattered type. Also revealed was the presence of a sciatic artery aneurysm partially filled with thrombotic masses (Fig. 2–4).

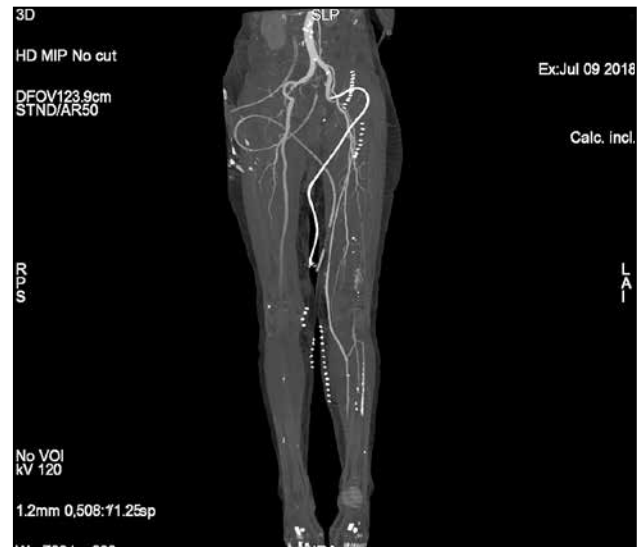


Fig. 4. RCT-angiogram of the aorta and arteries of lower limbs. Functioning internal iliac-posterior tibial autovenous shunt, occlusion of distal portions of the posterior tibial and anterior tibial artery of the left leg

The following clinical diagnosis was made: «Atherosclerosis. Atherosclerosis of lower-limb arteries. Aneurysm of the atypical sciatic artery of the left leg. Hypoplasia of the external iliac, common and deep femoral arteries on the left. Subacute thrombosis of tibial arteries of the left leg. The state after femoropopliteal bypass grafting as of November 16, 2017 on the left. Shunt thrombosis. Degree III CAI of the left leg. IHD».

The EchoCG findings revealed the following. Impairment of the rhythm: permanent form of atrial fibrillation, normo-tachysystole. Decreased global contractility function of the left ventricle (EF – 46%). Stage III hypertensive disease, normotension. Hypertrophy of the left ventricle myocardium, risk 4. Grade II mitral regurgitation. Ectasia of the fibrous ring of the tricuspid valve, grade III tricuspid regurgitation. Moderate-severity pulmonary hypertension (pulmonary artery systolic pressure – 55 mm Hg). Enlargement of both auricles, more of the left. Risk 4.

Accompanying diagnoses: «Degree I chronic heart insufficiency, FC – 3. C3A chronic kidney disease (CKD-EPI – 58 ml/min/1.73 m²). Stage I chronic gastritis, act. Leukopenia. Normochromic anaemia».

Relying on the findings of the examination performed, a conclusion may be drawn that the persistent sciatic artery had been subjected to constant traumatization in everyday life, which might have become a probable factor for aneurysm formation. Later on, in the cavity of the aneurysm there developed thrombi at each attempt to sit down and these thrombi were «squeezed out» from the cavity of the aneurysm to the PA and distal channel which resulted in new-onset thrombosis of the

PA in 2017. After the operation of femoropopliteal bypass grafting in 2017 the presence of the persistent sciatic artery was not taken into consideration, which promoted creation of competitive blood flow in the PA. Neither was the embolic aneurysm itself removed, which in total was the main cause of shunt thrombosis on July 1, 2018 at admission of the woman.

Given this peculiarity, we performed an operation consisting in internal iliac posterior tibial prosthetic repair using an autologous vein on the left with ligation of the atypical sciatic artery of the left leg. Surgery was performed under peridural anaesthesia.

Through a longitudinal approach along the median surface of the upper third of the crus we exposed the PA and posterior tibial artery (PTA). Revision: the PA in pronounced cicatricial adhesions after the previous intervention, which prevented from exposing it for sufficient length suitable for establishing an anastomosis, pulsing. The PTA pulsing, soft to touch. It was decided to apply a distal anastomosis on the PTA.

A pararectal approach in the left iliac-inguinal region was used to mobilise the external iliac artery, common iliac artery and the ostium of the internal iliac artery. It was decided to apply a proximal anastomosis on the IIA. We harvested the great saphenous vein on the right lower limb for a length necessary for shunt formation. The iliac arteries were temporarily cross-clamped. The IIA was resected. The persistent sciatic artery originating from the IIA was ligated. An end-to-end proximal anastomosis between the stump of the IIA and autologous vein was formed. A side-to-end distal anastomosis between the PTA and the autologous vein was formed. According to the data of control RCT-angiography the shunt was functioning (Fig. 4).

Symptoms of critical ischaemia disappeared. The patient was discharged with improvement. In the postoperative period the events of critical ischaemia did not return during 5-month follow up.

DISCUSSION

According to the statistics, amongst aneurysmatic lesions of the arterial bed 20% account for aneurysms of the iliac-femoral segment. Aneurysms of these localizations are often combined with abdominal aortic aneurysms and in more than 50% of cases are bilateral. Ruptured aneurysms are encountered relatively uncommonly but these aneurysms may lead to thromboembolic complications. They are encountered much more often in men than in women (the ratio is more than 20:1). As a rule, this diagnosis is made approximately at the age of 65 years. The risk for rupture of an aneurysm of the limb is low (<5% for popliteal and 1–14% for iliofemoral aneurysms).

Significantly of less common occurrence are aneurysms of other smaller arteries, which are often located in difficult-to-access zones. To them belong aneurysms of the sciatic artery. Because of sporadic clinical cases of aneurysms of sciatic arteries, no definitive standards for surgical treatment of this pathology have yet been developed.

Reviewing the literature we revealed various methods of treatment of this anomaly. Thus, Ferrero E. and Modugno P., et al. suggested endovascular treatment with the help of Multilayer Aneurysm Repair System (MARS) [3, 4]. Sato H., et al. performed the intervention using a stent graft [5], Lee A., et al. – with combined methods of treatment using the “Amplatzer” system and femoropopliteal bypass grafting with an autologous vein [6], Unosawa S., et al. – using iliac-popliteal prosthetic repair with an explant [7], Patel M.V. et al. – iliac-popliteal bypass grafting using an autologous vein with embolization of the aneurysm [8].

In particular, some authors report that resection of an aneurysm is associated with a high risk of damaging the sciatic nerve, therefore blood flow to the aneurysm is excluded without resection [7]. In our case the sciatic artery was ligated for decreasing blood supply of the aneurysm as much as possible. While performing control ultrasonographic examinations no evidence of continuing blood flow in the cavity of the aneurysm and sciatic artery was revealed. If the femoral artery developed adequately it can provide the inflow. However, in cases with scattered-type femoral artery, as observed in our patient, an autologous vein should be anastomosed to the iliac artery [7], which was done with the help of internal iliac-posterior tibial bypass grafting using an autologous vein with ligation of the atypical sciatic artery. No signs of gluteal-region ischaemia (tightening of muscles, elevation of lactate, myoglobin in dynamics) after ligation of the internal iliac artery (IIA) on the left were revealed, which was apparently associated with good collateral circulation from the basin of the deep femoral artery and blood supply from the IIA of the contralateral side.

CONCLUSION

The presence of a functioning persistent sciatic artery is a rare and insufficiently studied pathology which due to a dangerous anatomical location of the sciatic artery may lead to severe complications such as formation of an aneurysm, traumatization and rupture of the artery.

While making a therapeutic decision, one should take into consideration the peculiarities of embryology and topographic anatomy of the arterial bed of lower limbs.

Unawareness of this problem, inadequate diagnostic equipment of a hospital, incorrectly chosen therapeutic policy may result in increased operative risk, necessity of carrying out additional operative intervention,

the development of acute arterial insufficiency and in severe cases the necessity to perform major amputation of the limb.

The choice of operative intervention is based on the level and localization of an aneurysm, its size and embologenicity. Special role is plaid by the presence of events of critical ischaemia and occlusion of the distal channel.

Conflict of interest: none declared.

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