A Distal Pedal Artery Bypass in a Diabetic Patient with a Rare Involvement of Foot Vessels: Case Report

AYAK DAMARLARININ NADİR OLARAK TUTULDUĞU DİYABETİK HASTADA DİSTAL PEDAL ARTERİYEL BYPASS

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Abstract

Pedal arteries are often spared in cases of critical limb ischemia associated with diabetic atherosclerosis. We encountered a 59-year-old male patient with ischemic sole ulcers, whose pedal arteries were involved in diabetic atherosclerosis. Magnetic resonance angiography revealed bilateral occlusion of plantar arteries at their point of origin and a short segment of proximal occlusion in the right dorsalis pedis artery. The toe-systemic pressure index was 0.28 on the right, suggesting ischemia in the distal foot. The patient underwent right peroneal-distal pedal arterial short bypass with an in-situ saphenous vein graft. His symptoms regressed immediately after the surgery and the postoperative angiography revealed a functioning bypass graft. We believe that restoring sufficient blood supply through complete revascularization directly to the ischemic area is a promising procedure for the rapid treatment of ulcers especially in diabetic patients.

Key Words: Peripheral vascular disease, diabetes mellitus, atherosclerosis, prostaglandin E_1

Özet

Diyabetik ateroskleroz zemininde gelişen ciddi bacak iskemilerinde pedal arterler genel olarak korunmuştur. Bu olgu sunumunda, pedal arterlerin diyabetik aterosklerotik süreçte tutulduğu 59 yaşındaki erkek hasta ele alındı. Manyetik rezonans anjiyografik incelemede, plantar arterler her iki taraflı olarak çıkışlarından itibaren tıkalıydı ve proksimalindeki kısa bir segmental darlık sonrasında sağda dorsalis pedis arter açık olarak izlenmekteydi. Distal ayak iskemisi ile uyumlu olarak ayak başparmağı-sistemik basınç indeksi sağda 0.28 olarak ölçüldü. In-situ safen ven grefti kullanılarak sağ peroneal-dorsalis pedis arterler arasında kısa bir bypass gerçekleştirildi. Ameliyatın hemen sonrasında hastanın semptomları belirgin olarak geriledi ve yapılan kontrol anjiyografide bypass grefti açık olarak izlendi. Bu sonuç, özellikle diyabetik hastalarda, bölgesel olarak tıkayıcı ayak lezyonlarına bağlı olarak gelişen iskemik ülserlerin tedavisinde komple revaskülarizasyon stratejisinin gerekliliğini desteklemektedir.

Anahtar Kelimeler: Periferik vasküler hastalık, diyabet, ateroskleroz, prostaglandin E_1

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Diabetic atherosclerosis is a well-known cause of critical limb ischemia. It is characterized by multisegmental stenosis or occlusion of crural arteries due to medial calcification, obliterative macroangiopathy and neuropathic microcirculatory disorder. The foot vessels, particularly the dorsalis pedis artery, are often spared in most of the cases.[1] We performed a successful short bypass operation in a patient with segmental proximal obstruction of the right dorsalis pedis artery, the results of which are presented herein to highlight the efficacy of "complete revascularization" in diabetic atherosclerosis, even if the arterial lesion is located very distally.

Case Report

A 59-year-old male patient with poorly controlled diabetes mellitus, hypertension and ischemic heart disease was referred to our hospital with intractable bilateral foot pain and infective ulcers on the soles of his feet (Figure 1). On lower extremity examination, infrapopliteal pulsations were difficult to palpate bilaterally but pulses were detectable by portable Doppler ultrasound. Due to crural arterial calcification, ankle-systemic pressure index was not decreased, but the toe-systemic pressure index was 0.28 on the right and 0.31 on

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Figure 1. Preoperative condition of the feet.

the left, suggesting ischemia in the distal feet. Biochemical parameters were unremarkable except for fibrinogen and HbA_{1c} which were significantly elevated at 916 mg/dl and 11.2%, respectively, suggesting the possibility of a diabetic foot ulcer associated with a microcirculatory disorder. The plain-film radiography of the right foot demonstrated moderate calcification in the anterior tibial and dorsalis pedis arteries. On the right, magnetic resonance angiography revealed a patent distal segment of dorsalis pedis artery immediately following a short segment of proximal obstruction. The posterior tibial artery was occluded at its origin with some collateral formation from the peroneal artery distally. On the left, magnetic resonance angiography showed anterior and posterior tibial arterial occlusion followed by no clearly visible pedal arteries (Figure 2).

The patient underwent right peroneal-distal dorsalis pedis arterial short bypass with an in-situ greater saphenous vein graft. The intraoperative Doppler examination showed an initial graft flow of 11 ml/min, increasing to 22 ml/min after two intraarterial bolus administrations of 5µg prostaglandin E_1 (20µg PGE_1/20cc normal saline) through a side-branch of vein graft.

The patient's pain resolved immediately after the surgery. Although the healing process was slow, possibly due to persistently elevated levels of fibrinogen and HbA_{1c}, at 906 mg/dl and 7.8% respectively, the recovery of the ischemic ulcer on the right became evident ten weeks after the operation with sufficient pulsation over the bypass graft. Although there was also some improvement in the left sole ulcer, possibly due to better in-hospital control of patient's diabetes, healing of this ulcer was slower and ultimately less complete. The toe-

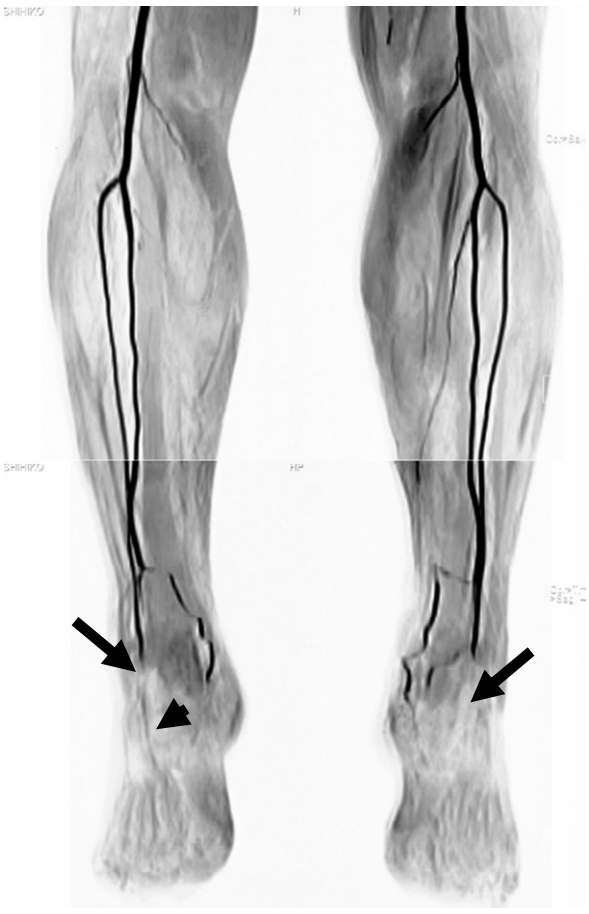

Figure 2. Preoperative magnetic resonance angiography. The two arrows indicate the areas involved in obstruction of dorsalis pedis artery on the right and left. The arrowhead indicates the patent distal segment of the right dorsalis pedis artery.

Figure 3. Postoperative digital subtraction angiography. The arrows indicate the proximal and distal sites of anastomosis.

systemic pressure index increased to 0.70 on the right and the postoperative digital subtraction angiography revealed a patent bypass graft (Figure 3).

Discussion

The principal of vascular reconstruction for the treatment of diabetic atherosclerosis lies in the restoration of direct and sufficient blood supply to the ischemic regions. Many investigators have reported improvements in patient quality of life and salvage of ischemic limbs following paramalleolar or pedal bypasses using autogenous vein grafts.[2,3] The distinguishing feature of this case was that, unlike the majority of the cases with diabetic atherosclerosis, the pedal arteries were also involved in the atherosclerotic lesion.

Although a microcirculatory disorder due to an elevated level of HbA_{1c} should also be considered, because of the presence of a non-healing ulcer and an intractable foot pain, we decided to perform bypass operation to the right dorsalis pedis artery distal to the short segmental proximal obstruction. A lack of demonstrable distal native arteries beyond the anterior and posterior tibial occlusions on the left precluded the possibility of a left-sided operation.

Regarding the inflow site of the bypass graft, we gained surgical access through a medial approach to compare the qualities of the peroneal and anterior tibial arteries. We selected peroneal artery as the inflow site for revascularization because the quality of the peroneal artery was superior to that of the tibialis anterior and posterior arteries. With the outcome in this patient, concordant with the literature, we think that distal origin vein bypass grafting is a very promising procedure reserved for diabetic patients.[4]

Another important finding in this patient was an overt increase in the graft flow following intragraft administration of PGE_1. It has been documented that PGE_1 offers significantly better flow rates and graft prognosis when injected in crural rather than popliteal grafts.[5] The minimum flow requirement for providing long-term patency of the vein grafts remains unclear, however, we also believe that, intraarterial infusion of PGE_1 is very useful in increasing the graft flow to a considerable level in cases with poor run-off or spastic distal arteries.

Due to the presence of a well-functioning graft as revealed by the postoperative angiography and the fact that the ulcer healing was much better on the right foot than on the left, where we were unable to operate, we believe that the microangiopathic state of diabetes may better be cured with

maintenance of increased blood supply through a bypass graft to the ischemic area directly. Thus, in diabetic patients with an intact or graftable native artery, we are more willing to consider bypass surgery and thereby establish a state of "complete revascularization" so that no residual ischemic areas remain.

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