

Successful short bypass to dorsalis pedis artery in a diabetic patient

Diyabetik hastada dorsalis pedis arterine kısa bypass

Can Çağlar Erdem, Nobuyoshi Azuma, Akira Nagamine, Keijiro Mitsube, Tadahiro Sasajima

Department of Surgery, Medicine Faculty of Asahikawa University, Japan

We report a 59-year-old diabetic male patient with a small but intractable ulcer on his right distal sole. Magnetic resonance angiography revealed disease-free peroneal and anterior tibial arteries continuing down to the ankle; however, plantar arteries were occluded at their point of origin and a short segment of proximal occlusion was found in the dorsalis pedis artery. The toe-systemic pressure index was 0.28, suggesting ischemia in the distal foot. A peroneal-dorsalis pedis arterial short bypass with an in-situ saphenous vein graft was performed; thereafter, the patient's ulcer regressed markedly. Present results justify an aggressive bypass strategy in patients with localized occlusive foot lesions.

Key words: Critical limb ischemia; diabetic atherosclerosis; pedal bypass; prostaglandin E1.

Diabetic atherosclerosis is a well-known cause of critical limb ischemia. It is characterized by multisegmental occlusions in the crural arteries, medial calcification and microcirculatory disorder due to neuropathy. One or more of the foot vessels are spared in most cases.^[1] However, in a diabetic patient presenting with an intractable foot ulcer and an elevated level of HbA1c, differentiating such an ulcer from one caused by a microcirculatory disorder alone may be difficult. We present a patient with an intractable sole ulcer who underwent a successful short bypass operation to the dorsalis pedis artery due to a proximal segmental occlusion.

CASE REPORT

A 59-year-old male patient with poorly controlled diabetes mellitus was referred to our hospital with intractable foot pain and an ulcer on the sole of his right foot (Fig. 1). Arterial pulses were palpable at the ankle and the ankle-systemic pressure index was 1.0; however,

Elli dokuz yaşında diyabetik erkek hasta, sağ ayak tabanı distalinde ülser ve ağrı nedeniyle başvurdu. Manyetik rezonans anjiyografik incelemede, ayak bileğine kadar olan bölümde peroneal ve anterior tibial arterler sağlam, plantar arterler çıkışlarından itibaren tıkalıydı ve dorsalis pedis arteri proksimalinde kısa bir segmental tıkanıklık vardı. Distal ayak iskemisi ile uyumlu olarak, ayak başparmağı sistemik basınç indeksi 0,28 olarak ölçüldü. In-situ safen ven grefti kullanılarak peroneal ve dorsalis pedis arterleri arasında kısa bir bypass gerçekleştirildi. Ameliyat sonrasında hastanın yarası belirgin bir şekilde geriledi. Bu sonuç, ayağın bölgesel olarak tıkaçıcı lezyonlarında agresif bir bypass stratejisinin gerekliliğini desteklemektedir.

Anahtar sözcükler: Ciddi kol-bacak iskemisi; diyabetik ateroskleroz; pedal bypass; prostaglandin E1.

the toe-systemic and the toe-ankle pressure indices were 0.28 and 0.32, respectively, suggesting ischemia in the distal foot. In addition, fibrinogen and HbA1c levels were high at 916 mg/dl and 11.2%, further suggesting the possibility of a diabetic foot ulcer associated with microcirculatory disorder. Magnetic resonance angiography revealed an occluded posterior tibial artery at its origin and disease-free peroneal and anterior tibial arteries in the calf; the latter was abruptly occluded for 2 cm in the ankle and thereafter the dorsalis pedis artery was poorly visualized (Fig. 2). Plain foot X-Ray radiography demonstrated moderate calcification in the anterior tibial and dorsalis pedis arteries.

Following diagnosis of distal foot ischemia due to proximal segmental occlusion of the dorsalis pedis artery, a peroneal-dorsalis pedis arterial short bypass using an in-situ saphenous vein graft was performed. Intraoperative ultrasound Doppler graft flow examination showed an initial graft flow of 11 ml/min, increasing to 22 ml/min after two intraarterial bolus adminis-

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Correspondence: Dr. Can Çağlar Erdem, Asahikawa Medical University, Department of Surgery, Asahikawa, Japan.
Tel: 1-843-817-8887 e-mail: drcanerdem@hotmail.com



Fig. 1. Intractable ulcer on the right sole.

trations of 5 µg prostaglandin E1 (20 µg PGE1/20 cc normal saline) through a side-branch of the vein graft.

The patient's pain disappeared immediately after surgery. The healing process was slow, probably due to still high levels of fibrinogen and HbA1c, at 906 mg/dl

and 7.8% respectively, but the ulcer on the distal sole healed completely after 8 weeks. The toe-systemic pressure index improved to 0.70 while postoperative digital subtraction angiography revealed a well-functioning bypass graft (Fig. 3).

DISCUSSION

The principle of arterial reconstruction for the treatment of diabetic atherosclerosis lies in the provision of direct and sufficient blood supply to the foot. A number of reports describe arterial reconstruction, claiming that paramalleolar bypasses are the most appropriate treatments in patients with critical limb ischemia due to diabetic atherosclerosis, as they offer acceptable foot salvage rates with improved patient quality of life.^[2,3]

The distinguishing feature of the present case was that, unlike the majority of the cases with diabetic atherosclerosis, plantar and pedal arteries were involved in the atherosclerotic lesion. Although a microcirculatory disorder due to an elevated level of HbA1c should also



Fig. 2. Preoperative magnetic resonance angiography showing disease-free peroneal and anterior tibial arteries with abrupt occlusion of the latter in the ankle (straight arrow). The plantar arteries are occluded at their point of origin. The distal segment of the dorsalis pedis artery is patent (broken arrow).



Fig. 3. Postoperative digital subtraction angiography showing a well-functioning peroneal-dorsalis pedis artery bypass. Arrows indicate the proximal and distal sites of anastomosis.

be considered, owing to the presence of a non-healing ulcer and an intractable foot pain as well as the significantly reduced toe-ankle pressure index, we decided to perform bypass to the dorsalis pedis artery distal to the segmental occlusion.

The peroneal artery was selected as the inflow site for revascularization due to its superior quality as well as the well-documented durability of peroneal bypasses.^[4] The minimum flow requirement for providing long-term patency of the vein graft remains unclear; however, intragraft infusion of PGE1 is effective in increasing and retaining graft flow at a sufficient level in cases with poor run-off distal arteries. Following this outcome, we also believe that distal origin short vein bypass grafting is a very promising procedure in diabetic patients.^[5]

The healing of the ulcer in the present case justifies an aggressive bypass strategy for patients with

intractable ischemic ulcers associated with occlusion of the main feeding artery into the foot.

REFERENCES

1. LoGerfo FW, Coffman JD. Current concepts. Vascular and microvascular disease of the foot in diabetes. Implications for foot care. *N Engl J Med* 1984;311:1615-9.
2. Pomposelli FB Jr, Marcaccio EJ, Gibbons GW, Campbell DR, Freeman DV, Burgess AM, et al. Dorsalis pedis arterial bypass: durable limb salvage for foot ischemia in patients with diabetes mellitus. *J Vasc Surg* 1995;21:375-84.
3. Neufang A, Dorweiler B, Espinola-Klein C, Reinstadler J, Kraus O, Schmiedt W, et al. Limb salvage in diabetic foot syndrome with pedal bypass using the in-situ technique. *Zentralbl Chir* 2003;128:715-9. [Abstract]
4. Best IM. Peroneal-plantar artery bypass: a prone approach. *J Vasc Surg* 2003;37:469-71.
5. Schmiedt W, Neufang A, Dorweiler B, Espinola-Klein C, Reinstadler J, Kraus O, et al. Short distal origin vein graft in diabetic foot syndrome. *Zentralbl Chir* 2003;128:720-5. [Abstract]