

Surgical Treatment for Buerger's Disease Using the Left Radial Artery as a Graft Conduit

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ABSTRACT. On a 35-year-old male patient with Buerger's disease in whom the lower limb veins could not be used because of repeated operations, the bypass operation using the radial artery was made. Revascularization surgery for his Buerger's disease had been performed twice in another hospital, but the bypass graft was occluded. The approach was made to the only patent anterior tibial artery from the lateral aspect of the leg by resecting the fibula and anastomosing the radial artery. The arm vein was anastomosed to this radial artery as a composite graft and was extended with approximately 6 cm of a ring-inforced ePTFE 6 mm (Gore-Tex) and anastomosed to the common femoral artery. Two years and a half after the operation, the patient is well and working with no symptoms in either the upper or lower limb. Using the radial artery at the site of anastomosis on the peripheral side, that affects the mid-term patency the most, prevents deterioration of the graft in the follow-up period and gives satisfactory mid-term results.

Key words: Buerger's disease — radial artery — anterior tibial artery

Buerger's disease is thromboangitis obliterans in which the extremities become ischemic, leading to amputation in the worst case. It exerts a great influence on a patient's quality of life. Revascularization surgery has frequently been performed in this disease, and the autologous saphenous vein has been used as the vessel of choice. In patients from whom lower limb veins cannot be collected because of repeated operations, an operation with a composite graft of the radial artery has been performed to obtain satisfactory results.

CASE REPORT

A 35-year-old male with intermittent claudication as the chief complaint was referred to hospital in February 1999. He had no history of diabetes mellitus, hypertension or hyperlipidemia. Following a diagnosis of Buerger's disease, he had undergone a left popliteal artery thromboendarterectomy in 1988 and a left femoro-below knee popliteal bypass with a composite graft of a prosthetic graft and an autologous saphenous vein in 1992 in another hospital. In 1993, however, the bypass graft occluded, and he underwent a left femoro-below knee popliteal bypass again simultaneously with a left lumbar sympathectomy. In August 1998, coldness in his left lower limb and intermittent claudication appeared. He had smoked one pack of cigarettes a

day for 14 years. The ankle brachial pressure index (ABI) was 1.11 on the right and 0.36 on the left. Angiography revealed complete occlusion of the arteries from the origin of the left superficial femoral artery to the tibio-peroneal trunk (Fig 1). In February 1999, a revascularization operation (a left femoro-anterior tibial artery bypass) was performed under general anesthesia. Autologous saphenous veins had already been collected on both sides, and no other autologous saphenous veins, including minor saphenous veins, usable as a bypass graft were available. Therefore, the radial artery and cephalic vein from the left forearm were harvested and used as a bypass graft. The radial artery was harvested in the manner in which it is used in coronary artery bypass surgery, and it was preserved in a Diltiazem hydrochloride solution (1 mg/ml) before use. In addition, Diltiazem hydrochloride was administered at a dose of 2 to 10 mg/kg/min during and after the operation to prevent spasm of the radial artery. Prior to the surgery, good palmar arterial arch continuity had been assured by the radial compression test of Allen. The anterior tibial artery was approached from the lateral aspect of the leg by resecting the proximal part of the fibula. End-to-side anastomosis of the radial artery graft to the anterior tibial artery was done with continuous 7-0 polypropylene sutures. The graft was led to the subcutaneous tissue on the medial side of the lower part of the thigh, where it was anastomosed end to end with the cephalic vein graft. Because the distance to the femoral artery was insufficient, we used approximately 6 cm of a ring-reinforced ePTFE 6 mm (Gore-Tex) to make a composite graft. Angiography performed at four days after the surgery revealed good patency of the bypass graft (Fig 2, 3). The

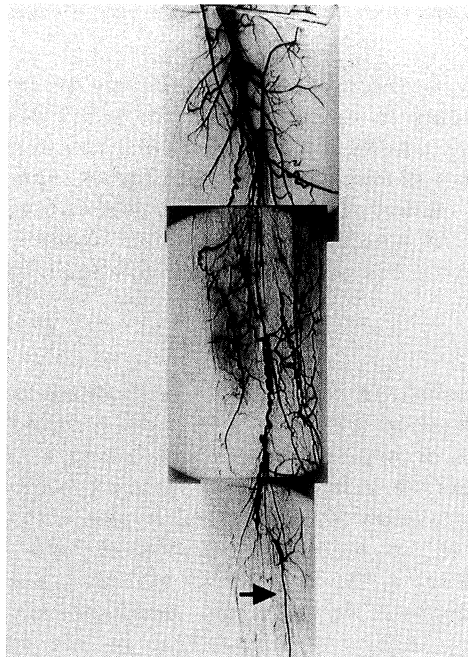


Fig 1. A preoperative angiogram revealed occlusion from the beginning of the left superficial femoral artery to the tibio-peroneal trunk. The black arrow indicates the only patent distal artery, the anterior tibial artery.

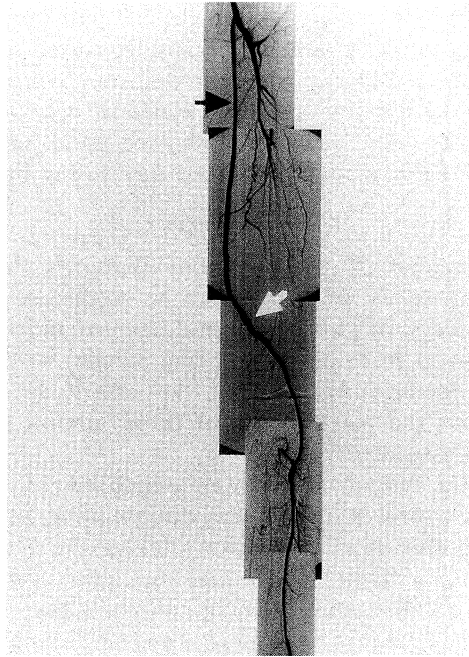


Fig 2. A postoperative angiogram showed a bypass graft with good patency. The black arrow indicates anastomosis of a prosthetic graft and the cephalic vein graft. The white arrow indicates anastomosis of the cephalic vein graft and the radial artery graft.

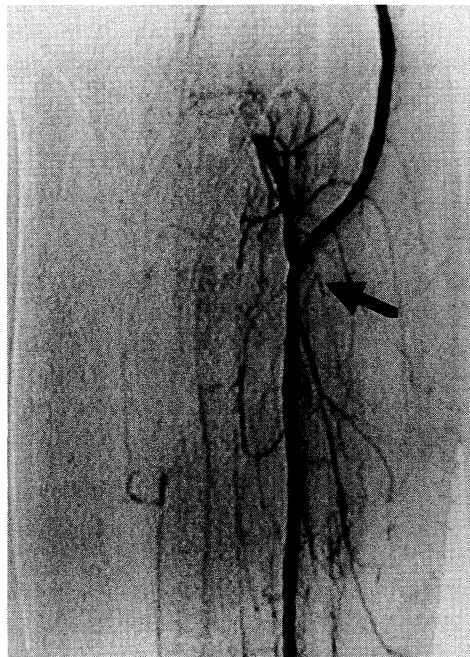


Fig 3. Postoperative angiogram. The black arrow indicates distal anastomosis to the anterior tibial artery.

postoperative ABI was restored to 0.95 on the left and intermittent claudication disappeared. Postoperative pharmacotherapy consisted of administration of Diltiazem hydrochloride 100 mg and Ticropidine hydrochloride 200 mg in addition to anti-coagulation therapy with Warfarin potassium. At present, 2.5 years after the operation, the bypass graft showed good patency and the patient is working well as a sales manager without any lower limb symptoms.

DISCUSSION

Although the number of patients with Buerger's disease is said to be decreasing in recent years,¹⁾ its importance as a disease remains unchanged. Buerger's disease develops in young and middle-aged individuals by preference, leading to amputation in some cases.^{2,3)} If the patency of the peripheral arteries is good, a bypass operation using such an artery as the outflow can be performed.³⁾ However, the patency rate of those arteries during the follow-up period has not been satisfactory.³⁻⁷⁾

In the 1970's, the radial artery was employed as a graft conduit for coronary artery bypass surgery, its use was discontinued because of the frequent occurrence of graft occlusion due to spasm during the acute phase. However, in one reported case, a graft which had occluded during the acute stage reopened during the chronic stage.⁸⁾ In recent years, the radial artery has once again come to be used widely as a graft conduit for coronary artery bypass surgery. In addition, its application has expanded to include use in heart surgery for children⁹⁾ and in bypass surgery for the carotid artery.¹⁰⁾ In the present case, lower limb veins had already been used in previous operations and no usable lower limb veins were available. There was a need for a graft conduit that could serve as a bypass for the only patent anterior tibial artery to assure long-term patency, so the left radial artery was used. The radial artery alone fell short of the length required, so an arm vein was used. Because the length was still insufficient, so we had to use about 6 cm of a ring-reinforced ePTFE 6 mm (Gore-Tex). Regarding the site of application, we used the radial artery for anastomosis with the anterior tibial artery which affects patency most, and then the arm vein and prosthetic graft for anastomosis with the femoral artery, which affects patency least. Use of the radial artery for revascularization surgery of the lower limb has previously been reported,¹¹⁾ but it was used as a bypass for a short segment in the popliteal artery. Our case may be the first reported use of the radial artery for part of a bypass of such a length. If deterioration of the graft during the follow-up period can be prevented by using the radial artery, better results may be expected than those obtained with a bypass using the lower limb veins.

With respect to the propriety of using the radial artery for patients with Buerger's disease, this disease is said to involve arteries of the upper limb in the progression of lesions. According to the report of Mills *et al*,³⁾ 8% of the patients had symptoms in both the upper and lower limbs, but considering the latent ischemic condition, the percentage of lesions extending to the upper limb must be higher. Future progression of lesions must also be considered. While many clinicians have raised objections to the use of arteries of the upper limb in operations for this disease, the use of the radial artery must be conditional on prevention of the future progression of lesions by absolute abstinence from smoking.

CONCLUSION

For the cases in which lower limb veins could not be used as a bypass conduit because of repeated operations, we performed revascularization surgery on the anterior tibial artery with a composite graft using the radial artery to obtain satisfactory results. Absolute abstinence from smoking is required to prevent future progression of lesions to include the upper limbs.

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