Journal of Plastic, Reconstructive & Aesthetic Surgery (2014) 67, 1136–1143

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

Successful lower extremity salvage with free flap after endovascular angioplasty in peripheral arterial occlusive disease

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Received 26 September 2013; accepted 29 April 2014

KEYWORDS
Peripheral vascular disease;
Angioplasty;
Free tissue flaps

Summary *Objective:* Most patients with peripheral arterial occlusive disease undergo lower limb amputation due to complex wounds on their lower extremities. We have taken the challenging approach of combining angioplasty and free tissue transfer for limb salvage.
Methods: Between October 2011 and December 2013, 11 patients (average age of 56.8 years; ranged from 43–72 years old) with peripheral arterial occlusive disease of main tibioperoneal arteries underwent preoperative angioplasty. Afterward, free tissue transfers (nine anterolateral thigh free flaps, one vastus lateralis muscle free flap, and one deep femoral artery perforator flap) were performed on these patients for lower extremity salvage and reconstruction.
Results: All 11 free tissue transfers after angioplasty were successful without operative mortality or major complications. Minimal wound dehiscence was seen in one case, and partial flap necrosis was seen in the other cases. During the follow-up period, all of the patients had their wounds healed completely and achieved acceptable contour and quality of gait.
Conclusion: The preoperative angioplasty provides well-vascularized tissue that both controls infection and helps free flaps to survive. Therefore, the patients due to receive leg amputation in spite of the free tissue transfer can achieve limb salvage by using the additional technique of angioplasty. This combined approach was successful in preserving the functional aspects along with the aesthetic results for the lower limb reconstruction.

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http://dx.doi.org/10.1016/j.bjps.2014.04.021

Background

The patients with lower limb ischemia and traumatic extensive lower extremity wounds pose significant challenges in clinical management. The vascular pathologic condition of the patients is also a more important issue of concern. The enthusiasm for limb salvage using a microsurgical technique for peripheral arterial occlusive disease (PAOD) patients has remained low, due to the concerns about arterial occlusion and flap failure. PAOD is a progressive disease occurring as a result of atherosclerosis in the arterial system that carries blood to the extremities as well as vital organs. Despite the considerable advancement in microvascular surgery, many patients with PAOD undergo lower limb amputation due to complex wounds on their lower extremities. These patients suffer from a greatly decreased quality of life, in addition to the burden from the cost for treatment.[1] In elderly patients, limb salvage is superior to limb amputation for both mortality and functional status.[2] The use of microvascular free tissue transfer has been described as an adjunct to lower extremity revascularization in the patients with complex ischemic or infected wounds. However, the safety and long-term durability of the combined procedure have not been completely documented. To answer these and other questions, our department underwent the combined revascularization and free flap coverage for large lower extremity open wounds secondary to chronic ischemia or trauma. Herein, we report 11 cases of successful lower limb reconstruction in the patients with PAOD, using preoperative angioplasty of recipient arteries combined with free tissue transfer.

Methods

This is a retrospective study of 11 (four female and seven male) patients with PAOD who underwent preoperative angioplasty and reconstruction using free tissue transfer (anterolateral thigh free flap in nine cases, and deep femoral artery perforator flap and vastus lateralis muscle free flap in one case) for lower extremity salvage, from October 2011 to December 2013 at the Ajou University Hospital. The angiography and operation were performed at the Department of Radiology and the Department of Plastic and Reconstructive Surgery, respectively. The records of 11 patients were reviewed for medical comorbidities, wound location and size, computed tomographic angiography findings, flap type, flap outcome, intraoperative arterial findings, and technique of anastomosis. Furthermore, the postoperative complications and both ambulatory status and contour were evaluated. All of the patients had endovascular angioplasty, ballooning, or stenting before the reconstruction. Additionally, obstructive arteries including three completely occluded arteries were used as the recipient arteries for free flap after revascularization.

Preoperative assessment

All patients, before free tissue transfer, had received preoperative assessment for recipient vessel evaluation through computed tomographic angiography. Every patient with faint sound of a Doppler was examined by the Vascular Interventional Radiologic Department. All of the patients required lower extremity angioplasty with stenting or ballooning. Afterward, patent revascularized artery was confirmed using Doppler sound preoperatively and during the operation. The patients likely to have osteomyelitis were diagnosed using the bone scan and magnetic resonance imaging. Two patients diagnosed with osteomyelitis were examined by the Orthopedic Surgery Department. The hemoglobin A1C and blood sugar level of the patients were measured to diagnose diabetes mellitus and were controlled strictly prior to the reconstruction.

Surgical technique

To evaluate the patency of the vessels, the recipient artery and vein were first examined. After confirming the patent flow, debridement of necrotic tissues was performed until the healthy viable tissue was exposed. A total of 11 free tissue transfers were performed; nine anterolateral thigh free flaps, one vastus lateralis muscle free flap, and one deep femoral artery perforator flap were harvested as previously documented.[3–8]

After flap harvesting, the donor artery was anastomosed to the anterior tibial artery or posterior tibial artery, using the end-to-side (ETS) method in nine cases and the end-to-end (ETE) method in two cases. At this point, the anastomosis site was chosen after the exposure of a clean intimal wall. Afterward, the flap was inset without much tension. A meshed skin graft was covered on the vastus lateralis muscle free flap after insetting. Every patient was given low molecular weight heparin to improve microsurgical anastomotic patency.

If the flap was stable, a tight compression stocking was applied on the flap to decrease edema and prevent wound dehiscence during rehabilitation. During the follow-up period, each patient was asked of any discomfort in the gait or in wearing shoes, for evaluating the contour of the flap.

Results

The ages of the patients ranged from 43 to 72 years, with an average age of 56.8 years. The follow-ups ranged from 7 to 26 months, with an average of 16.3 months. The most relevant information about the patients is summarized in Table 1. A total of 11 free tissue transfers using nine anterolateral thigh free flaps, one vastus lateralis muscle free flap, and one deep femoral artery perforator flap were performed. One case was reconstructed with a deep femoral artery perforator flap, because a faint perforator sound on both anterolateral thighs was detected.

All of the patients had medical problems other than PAOD: three of them were heavy smokers; diabetes mellitus was diagnosed in nine patients, so the strict blood glucose control was done before the surgery; hypertension was diagnosed in nine patients; four patients were on chronic dialysis for the end-stage renal disease; four patients had coronary artery obstructive disease; two patients were diagnosed with calcaneal osteomyelitis; and three patients had severe PAOD with amputation status of below-the-knee on the opposite site of their wounds. The details about the medical diseases in each patient are in Table 2.