



## Case Reports and Series

## A Hybrid Therapy for Buerger's Disease Using Distal Bypass and a Free Temporoparietal Fascial Flap: A Case Report

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## ABSTRACT

Buerger's disease presents a difficult challenge, with its uncertain etiology and lack of a standardized therapy, and is often refractory to treatment. In the present report, we have described the case of a 43-year-old male with Buerger's disease, a refractory ulcer on his right great toe, and severe pain at rest. We obtained favorable results using a hybrid therapy that combined distal bypass with a free temporoparietal fascial flap. Post-operatively, the flap healed, and the patient's pain resolved. After more than 3 years of follow-up, he had had no recurrence of the foot ulceration, and the patency of the bypass graft had been confirmed using Doppler flowmetry. We believe that the hybrid therapy we devised for the present patient (ie, combined distal bypass with a free temporoparietal fascial flap) is an effective treatment of Buerger's disease with pedal ulceration. The therapeutic strategies for this condition should not adhere to a single treatment modality; rather, they should combine available treatment modalities according to each individual patient's condition.

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The prevalence of peripheral arterial disease has increased with the aging of the population and the increase in lifestyle-related diseases. Thus, cases of critical limb ischemia requiring major amputation have also increased, and the appropriate therapeutic strategies for these patients are therefore extremely important. As surgeons treating these conditions, we should use the various treatment modalities available in the right combination with the right timing, according to each individual patient's condition. In particular, Buerger's disease presents a difficult challenge because of its uncertain etiology, lack of a standardized therapy, and tendency to be refractory to treatment. In the present report, we have described the case of a patient with Buerger's disease, a nonhealing ulcer on his right great toe, and severe pain at rest. We obtained favorable results with a hybrid therapy combining distal bypass with a free microvascular temporoparietal fascial (TPF) flap.

### Case Report

A 43-year-old male had developed pain in his right great toe and intermittent claudication in the right leg in February 2004. He was

evaluated at the internal medicine clinic at our institution and diagnosed with suspected peripheral arterial disease. Subsequent assessments, including angiographic studies, confirmed the diagnosis of Buerger's disease. His pain was ameliorated with pharmacotherapy, including intravenous prostaglandin E<sub>1</sub>, oral aspirin, and nonsteroidal anti-inflammatory drugs. His condition subsequently deteriorated, however, and he developed an ulcer at the distal, medial aspect of his right great toe and aggravation of the pain at rest and intermittent claudication, all of which failed to improve with pharmacotherapy alone. Therapeutic neovascularization (peripheral blood mononuclear cell transplantation) was attempted in June 2007 without effect, followed by a lumbar sympathetic ganglion block in August 2007, again resulting in no improvement. Also, his pain was not alleviated by administration of pentazocine-hydroxyzine hydrochloride, amitriptyline hydrochloride (a tricyclic antidepressant), or additional use of nonsteroidal anti-inflammatory drugs. At this stage, pain control could not be achieved even with therapeutic doses of codeine phosphate. The patient was in an extremely distressed psychological state by this time and was referred to our department for consideration of surgical revascularization of his right lower extremity.

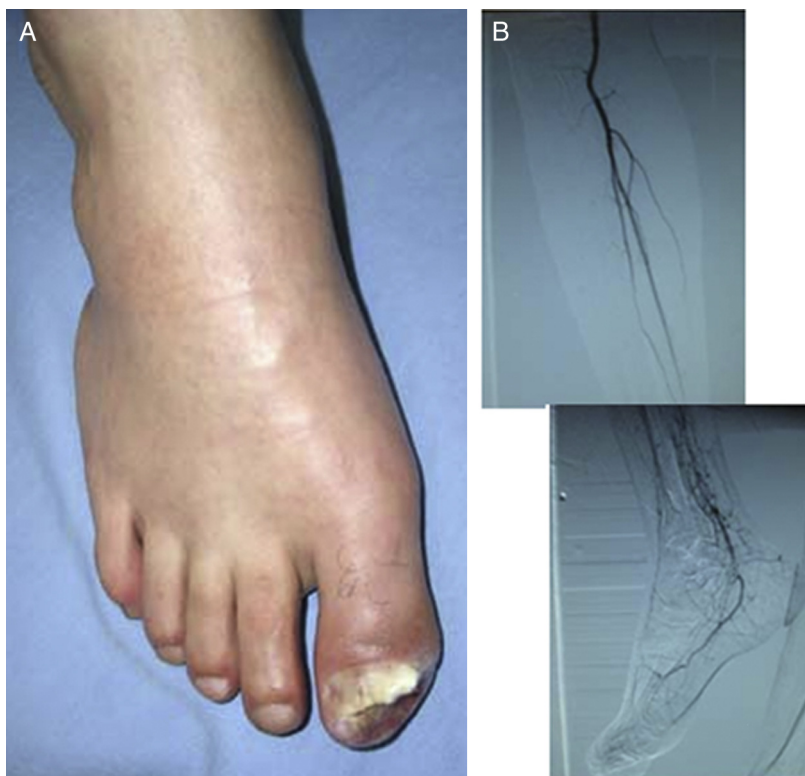
When we first examined him, the findings included a cold right lower limb, with the foot hairless and with shiny, atrophic skin. An ulcer was present at the distal, medial aspect of his hallux, with the distal phalanx exposed (Fig. 1). The patient's pain level was 10 cm (maximum) on the visual analog scale, consisting of a 10-cm horizontal line with the 2 endpoints labeled "no pain" and "most

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**Fig. 1.** (A) An ulcer was present on the distal phalanx of the great right toe with exposed bone. (B) Preoperative angiogram. Angiography revealed no dominant structures proximal to the popliteal artery, the anterior tibial artery occluded from its origin, with the peroneal artery narrowed from the midpoint of the lower leg and occluded at the level of the ankle joint. Although the posterior tibial artery was occluded over a 10-cm segment, the plantar artery could just be made out through collateral run off.

pain.” The patient experienced no relief from narcotic analgesics. Plain radiography showed osteolysis of the distal phalanx of the right great toe. Angiography revealed no dominant strictures proximal to the ipsilateral popliteal artery, and the anterior tibial artery was occluded from its origin, with the peroneal artery narrowed from the midpoint of the lower leg and occluded at the level of the ankle joint. Although the posterior tibial artery was occluded for a 10-cm segment, the plantar artery could just be visualized through collateral run off (Fig. 1B).

Endovascular catheterization therapy was ruled out owing to the risk to the posterior tibial artery, the only run off vessel. Sympathectomy was also ruled out because of the lack of success of the previous lumbar sympathetic ganglion block. We therefore decided to perform distal bypass combined with a free TPF flap with the aim of improving perfusion of the right foot and healing the ulcer (Figs. 2 and 3). Major amputation of the right lower extremity was also considered.

After discussions with the patient, we first created a reversed ipsilateral saphenous vein graft from the popliteal artery to the dorsal pedis artery. The greater saphenous vein was harvested through small transverse incisions. We then laid a TPF flap under the skin of the dorsum of the foot at the distal end of the bypass graft, with the aim of stabilizing the run off from the distal end of the bypass graft; we also anticipated that it would function as a nutrient flap (Fig. 3B). We created an end-to-side anastomosis between the superficial temporal artery and the distal wall of the bypass graft and an end-to-side anastomosis between the superficial temporal vein and the dorsalis pedis vein of the foot. We then covered the exposed bone with a TPF flap at the base of the ulcer on the great toe and performed a split-thickness skin graft (Figs. 2 and 3) to cover the reconstruction.

The postoperative course was favorable, with the skin flap taking well. The patient’s pain level had improved to 3 cm on the visual analog scale by the eighth postoperative day. He had resumed wearing regular shoes by about 8 weeks postoperatively and had resumed his regular activities by about 8 weeks postoperatively. After more than 3 years of follow-up evaluations, he had experienced no recurrence of the right foot ulceration, and repeat Doppler flowmetry had confirmed persistent patency of the bypass graft (Fig. 4). Furthermore, his right lower extremity pain had resolved, and he no longer required analgesic medication throughout the follow-up period. But, the superficial femoral artery, with arteriosclerosis obliterans (ASO), was occluded at 3.5 years since the procedure, he was transferred to another hospital for the treatment of ASO. We made every effort to preserve our patient’s privacy in the present report and obtained informed consent from him to present this description of his case.

## Discussion

The precise cause, or causes, of Buerger’s disease remains unknown. The condition is a difficult vascular disease to treat, and no definitive standardized surgical intervention aimed at treating this disease has been defined. The treatment options have included endovascular therapies (1–4), sympathectomy (1,3), bypass surgery (1–3), stem cell injections (5–7), and gene therapies (8). One study reported that only 38.3% of patients with Buerger’s disease underwent bypass surgery, with a graft patency rate of 33% at 3 years after bypass surgery, compared with 60.6% of patients with arteriosclerosis obliterans (9). Another report noted that graft patency was 50% at 5 years after bypass surgery in patients with Buerger’s disease (10). These

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