

Using a Hybrid Approach to Treat Chronic Limb-Threatening Ischemia

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Abstract: Chronic limb-threatening ischemia is a major public health concern, given its association with increased mortality, risk of amputation, and impaired quality of life. The arterial lesions are often extensive, reaching several levels and making revascularization complex. Hybrid treatment, which combines the advantages of open surgery and endovascular therapy, may be helpful. We present the case of a 74-year-old man with a history of myocardial infarction, stage 3 chronic kidney disease, arterial hypertension, dyslipidemia, and diabetes. Nine years earlier, he had a femoropopliteal bypass; 7 years earlier, a femorotibial bypass and transmetatarsal amputation; and 2 years earlier, a new femorotibial bypass with ligation of the superficial femoral artery ostium. He developed a gangrenous foot stump (Rutherford classification stage 5) following a subacute thrombosis of his last femorotibial bypass. We performed retrograde transluminal femoropopliteal recanalization and a short prosthetic bypass between the common femoral artery and the proximal part of the superficial femoral artery. Six months later, the foot stump was healed. In conclusion, hybrid treatment may be helpful to revascularize limbs with multilevel complex occlusive arterial disease. When open surgery is realized, it is mandatory to avoid any arterial ligation to keep potential future percutaneous treatment possible.

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Key words: chronic limb-threatening ischemia, CLTI, hybrid treatment, revascularization

Introduction

Chronic limb-threatening ischemia (CLTI) is a clinical syndrome defined by the presence of peripheral arterial disease (PAD) in combination with rest pain, gangrene, or a lower limb ulceration of more than 2 weeks' duration. CLTI represents the end stage of PAD. The incidence of PAD is increasing, reaching 202 million people worldwide in 2010 and 236 million in 2015.¹ CLTI is associated with high morbidity and mortality. The all-cause mortality rate of untreated CLTI is 22%; major amputation rate, 22%; and worsened wound or ulcer rate, 35%.² The risk of amputation is especially present in the first year.³

Management of CLTI is complex due to the extension of involved lesions. In such cases, an endovascular approach combined with an open surgical approach may be justified. Results of hybrid treatment are 91% limb salvage at 1 year; 80% survival; 76% amputation-free survival; 87% wound healing; and 88% freedom from target lesion revascularization.^{4,5}

We present the case of a patient who previously underwent several bypass procedures in the right lower limb and presented with new threatening ischemia. He benefited from a hybrid approach.

Case Report

A 74-year-old man presented to the emergency department with a wound, ischemia, and foot infection (WIFI) classification W2 I3 fI2 right foot stump (**Figure 1**). He had a significant



Figure 1. Right foot stump before revascularization.

history of myocardial infarction, stage 3 chronic kidney disease, arterial hypertension, dyslipidemia, and diabetes. Nine years earlier, he had a below-the-knee femoropopliteal venous bypass; 7 years earlier, a femoroposterior tibial bypass with a small saphenous vein graft and transmetatarsal amputation; and 2 years earlier, a revision of the femoroposterior tibial bypass using a radial artery in the proximal segment and ligation of the superficial femoral artery (SFA) ostium.

Computed tomography angiography highlighted thrombosis of the femoroposterior tibial bypass and a grade 4 Global Limb

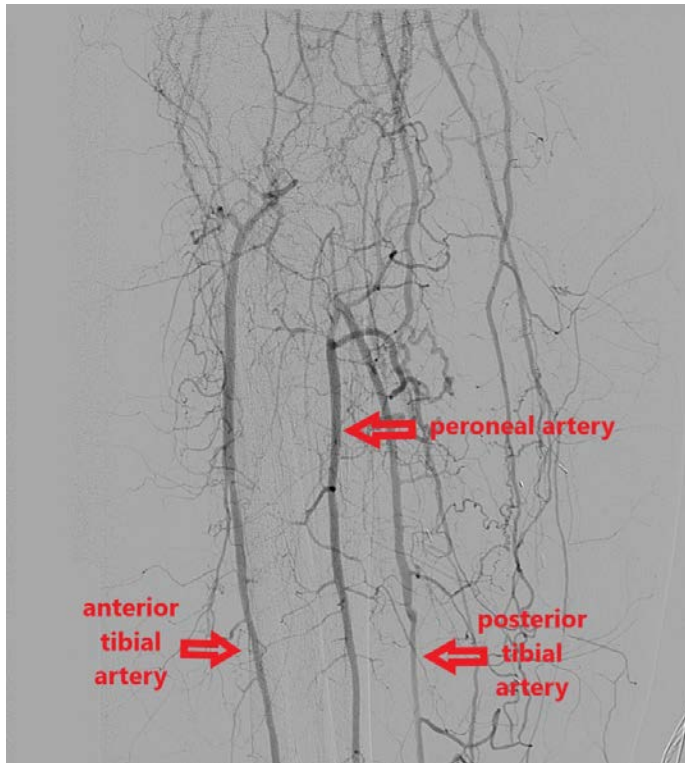


Figure 2. Pre-treatment angiography showing popliteal occlusion, tibioperoneal trunk occlusion, and patent runoff vessels.

Anatomic Staging System femoropopliteal and tibioperoneal trunk chronic total occlusion (CTO). Runoff vessels were patent (**Figure 2**). Through retrograde posterior tibial puncture, we tried to recanalize the CTO but were not able to get into the common femoral artery (CFA) because the SFA ostium was ligated (**Figure 3**). We performed a short Dacron prosthetic bypass between the CFA and the proximal part of the SFA (**Figure 4**), followed by stenting of the whole SFA and the proximal third of the popliteal artery with drug-eluting stents. The distal part of the popliteal artery and the tibioperoneal trunk were treated with balloon angioplasty.

During follow-up, a bone infection at the foot stump was treated by first metatarsal resection and antibiotherapy for 6 weeks. After 12 months, the femoropopliteal arterial axis was patent and the foot stump was healed after 6 months (**Figure 5**).

Discussion

CLTI is a major public concern with potentially serious consequences. Prevalence is rising due to an increase in risk factors, especially an aging population and diabetes.⁶ Several classifications and definitions have been proposed, but among vascular surgeons the Rutherford classification is the most widespread. This classification has an important clinical significance given its association with the risk of amputation (4.6% in Rutherford stages 1 through 3; 12.1% in stage 4; 35.3% in stage 5; and 67.3% in stage 6) as well as the risk of death (18.9%, 37.7%,

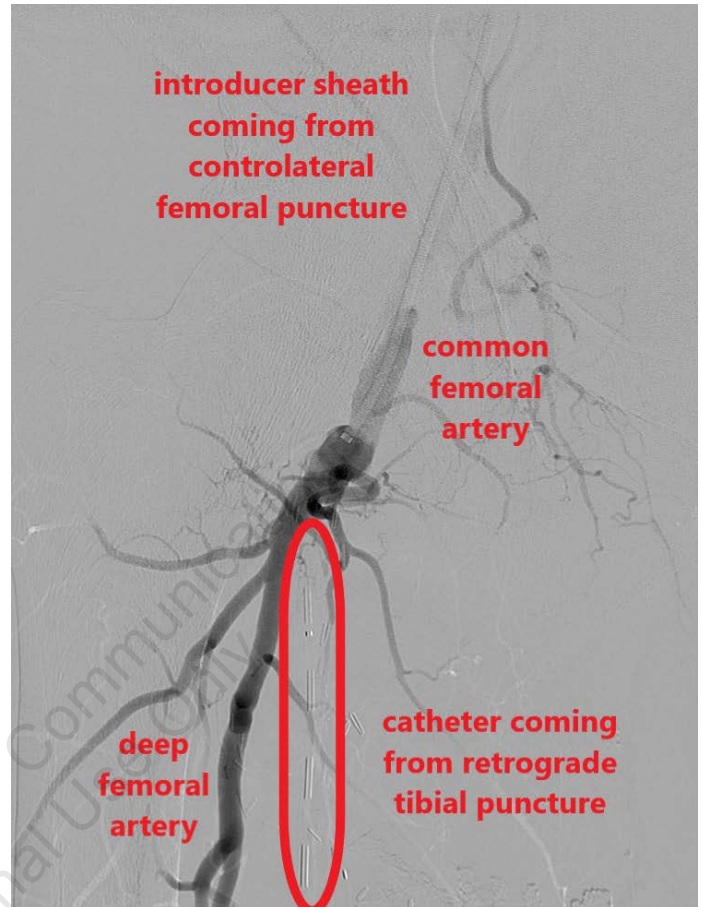


Figure 3. Per-treatment angiography showing the catheter coming from a retrograde puncture, unable to advance into the common femoral artery because the superficial femoral artery ostium was ligated.

52.2%, and 63.5% in Rutherford stages 1 through 3, 4, 5, and 6, respectively), myocardial infarction, and stroke.⁷ Thus, the purpose of CLTI treatment is multifold: Salvage the threatening limb and reduce cardiovascular morbidity and mortality by using the best medical therapies (management of diabetes and hypertension, lipid-lowering therapy, use of antiplatelet agents) and act on modifiable risk factors (tobacco use, lifestyle modifications, diet and exercise).⁸

Revascularization techniques for CLTI are based on 3 points: patient risk, limb severity, and anatomic complexity.⁸ Extensive multilevel atherosclerotic disease is frequently associated with multiple medical comorbidities, making patients with CLTI at high risk for extensive open surgical procedures.⁵ Our reported case had multiple bypass surgeries. Percutaneous treatment will not always allow complete revascularization. Thus, a hybrid approach may help revascularize CLTI.⁹ Our patient needed open surgery because his SFA ostium had been ligated during one of the previous surgeries. The femoropopliteal arterial axis could be recanalized percutaneously.

Regarding the literature, the hybrid approach is an attractive alternative to important open surgery, with a technical success rate of 96%; limb salvage rate of 95%; and patency rate

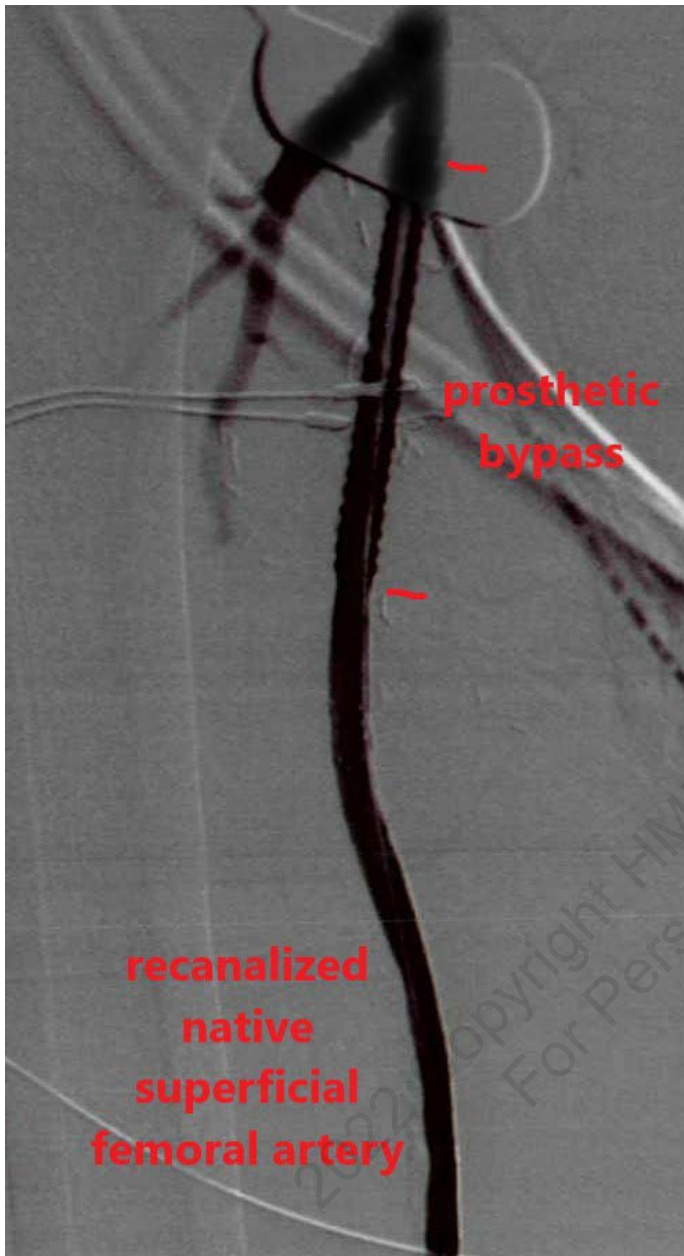


Figure 4. Per-treatment angiography showing the short prosthetic bypass implanted between the common femoral artery and the recanalized native superficial femoral artery.

at 2 years of 93%.⁹ As to the importance of revascularization, complete revascularization (CR) vs incomplete revascularization (IR), major amputation (CR, 2.7%; IR, 13%) and major amputation-free survival (CR, 97%; IR, 81%) rates at 3 years are different.¹⁰

Conclusion

CLTI is a major health problem. Hybrid treatment combining open and endovascular surgery may help revascularize limbs with multilevel PAD. It is a good compromise between the



Figure 5. Healed right foot stump.

need for complete revascularization and patients weakened by their comorbidities. This case report emphasizes that when open surgery is realized, it is mandatory to avoid any arterial ligation to keep potential future percutaneous treatment feasible. ■

Disclosure: The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors report no conflicts of interest regarding the content herein.

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