

## The role of computed tomography angiography for popliteotibial bypass: a successful limb salvage procedure

*Popliteotibial baypasta bilgisayarlı tomografi anjiyografinin rolü:  
Başarılı bir ekstremite kurtarma işlemi*

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### ABSTRACT

Herein, we present a successful surgical treatment of a 64-year-old male patient with critical ischemia due to atherosclerotic occlusion of the popliteotibial segment. Conventional angiography revealed total popliteal occlusion without distal run-off. Repeated computed tomography angiography showed poor distal flow of the anterior tibial artery and peroneal artery and proximal severe stenosis of the posterior tibial artery. Popliteodistal bypass using a reversed great saphenous vein was performed with antibiotherapy for limb salvage. We present this case for its rarity and difficulty in decision-making.

**Keywords:** Critical limb ischemia; distal bypass; occlusive disease.

Critical limb ischemia (CLI), one of the major forms of peripheral arterial disease, is associated with increased morbidity and mortality rates.<sup>[1-3]</sup> A reversed great saphenous vein is the optimal conduit for infrainguinal revascularization.<sup>[1-4]</sup> The Rutherford category IV-VI and Fontaine stages III/IV are the critical ischemia stages of the atherosclerotic disease.<sup>[1-4]</sup> Popliteotibial bypass can be used for infragenicular revascularization of CLI with acceptable results.<sup>[2,3]</sup> Medical therapy includes wound care, antiplatelet therapy, and anti-inflammatory therapy including statins, whereas surgical therapeutic options are distal bypass surgery, thromboendarterectomy, and amputation.<sup>[1-4]</sup>

### CASE REPORT

A 64-year-old man presented with severely infected right foot ulcers, suggesting amputation.

### ÖZ

Bu yazıda, popliteotibial segmentin aterosklerotik tıkanması nedeniyle kritik iskemili 64 yaşında erkek bir olgunun başarılı cerrahi tedavisi sunuldu. Konvansiyonel anjiyografide distal açıklık olmaksızın, total popliteal oklüzyon izlendi. Tekrarlanan bilgisayarlı tomografi anjiyografide anterior tibial arter ve peroneal arterde zayıf distal akım ve posterior tibial arterde proksimal ciddi darlık saptandı. Ekstremitenin kurtarılması için antibiyotik tedavisi ile tersine çevrilmiş büyük safen ven kullanılarak, popliteodistal baypas yapıldı. Bu olgu nadir olması ve karar verme zorluğu açısından sunuldu.

**Anahtar sözcükler:** Kritik bacak iskemisi; distal baypas; tıkaçıcı hastalık.

Conventional angiography revealed total popliteal occlusion without distal run-off. Repeated computed tomography (CT) angiography showed poor distal flow of the anterior tibialis artery and peroneal artery with a relatively satisfactory diameter of the posterior tibial artery with a high-grade (90%) proximal occlusion (Figure 1). We performed popliteotibial bypass with a saphenous vein after a couple of days of antibiotherapy.

We observed a dramatic healing of the wound postoperatively and CT angiography showed an excellent distal flow including some antegrade flow in the anterior tibial artery (Figures 2, 3). We believe that CT angiography is an efficacious technique, when other conventional angiographies are insufficient for the management of CLI.



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**Figure 1.** A computed tomography angiography image showing posterior tibial artery with a high-grade proximal occlusion.

## DISCUSSION

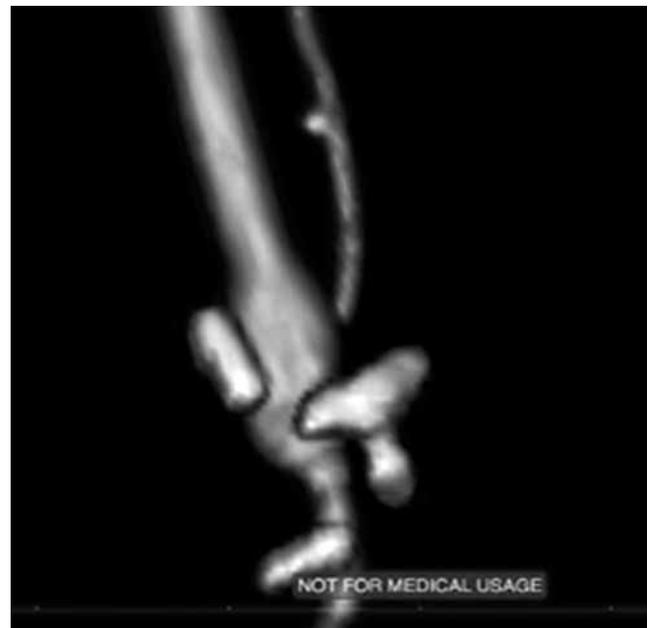
Limb loss is associated with tobacco use, advanced age, early graft failures, and repeated revascularization procedures.<sup>[1-3]</sup> It leads to significant patient morbidity and mortality.<sup>[2,3]</sup> Major indications for popliteotibial bypass include chronic limb ischemia and disabling

claudication.<sup>[2-4]</sup> In addition, CLI is significantly associated with increased morbidity and mortality rates and considerably utilization of health and social resources in both developed and developing countries.<sup>[5]</sup> Critical limb ischemia continues to grow in global prevalence. It may present with more than two weeks of the limb rest pain, ulcers, or limb gangrene. The management of CLI is multidisciplinary and involves primary care vascular specialists with a broad range of treatment modalities. Calcification, small-caliber arteries, diffuse infrapopliteal disease, and poor run-off are the major important endpoints for CLI.<sup>[4,5]</sup>

Kazakov et al.,<sup>[6]</sup> used femoral-popliteal shunting using a reversed saphenous vein graft for patients with atherosclerotic occlusion of the femoral-popliteal-tibial segment in the stage of critical ischemia. The authors also performed distal femoral-tibial bypass grafting with good long-term patency rates. In another study, Tsuji et al.<sup>[7]</sup> showed that the clinical outcomes of distal bypass without prior infrapopliteal endovascular treatment (EVT) were not superior to those of distal bypass after ipsilateral infrapopliteal EVT failed. The authors concluded that failed infrapopliteal EVT did not have a negative impact on the outcome of subsequent ipsilateral distal bypass in patients with CLI. Moreover, Gulati et al.<sup>[8]</sup> demonstrated that conservative and surgical treatments along with endovascular techniques allowed excellent opportunities for treating complicated conditions for wound healing and limb salvage.



**Figure 2.** A computed tomography angiography image showing vein graft patency.



**Figure 3.** An excellent distal flow in the anterior tibial artery.

Critical limb ischemia is characterized by rest pain and tissue loss in the form of ulceration or gangrene.<sup>[7,9]</sup> Medical management and endoluminal procedures still yield less than desired results for tibial vessel occlusive disease. Autogenous vein is the most effective conduit for infrainguinal arterial bypass procedures for bypass to the infrapopliteal arteries, in particular.<sup>[4-9]</sup>

This case report presents a successful surgical limb salvage-infrapopliteal distal bypass procedure. The saphenous vein graft was anastomosed between the popliteal artery and anterior tibial artery (Figure 3). Successful popliteotibial bypass is associated with good long-term patency and limb salvage rates (at 5 years, 62%).<sup>[1]</sup> Adverse prognostic factors are of utmost importance for ultimate limb salvage and efficacy of popliteal-distal bypass. After a careful risk-benefit analysis, the optimal therapy for selected patients with disabling claudication should be selected. The management of the disease may be individualized based on the degree of functional impairment. An effective revascularization of CLI is based on the anatomical patency.

In conclusion, patients undergoing popliteotibial bypass for critical limb ischemia should receive cardioprotective medications and the associated risk factors should also be treated. We also suggest that computed tomography angiography which has several merits including volumetric acquisition which permits the visualization of the anatomical structures from multiple angles and in multiple planes, its less-invasive nature, and fewer complications may be helpful, when conventional angiography remains insufficient.

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