

Multi-Level Endovascular Intervention for Severe Peripheral Arterial Disease: A Case Report and Literature Review

Jay Prashar¹, Ibrahim Ibikunle¹, Saad Balamane¹, Dr. Herbert Oye²

¹Avalon University School of Medicine

²Raleigh General Hospital

ABSTRACT: Peripheral arterial disease (PAD) is a progressive atherosclerotic condition that may involve multilevel arterial segments and often coexists with aneurysmal disease. We report the case of a 78-year-old male with extensive cardiovascular comorbidities who underwent staged multilevel endovascular revascularization of the tibial and femoropopliteal segments for severe PAD with concomitant aneurysmal disease. Following abnormal vascular imaging during preoperative cardiac clearance, he underwent right tibial and tibioperoneal trunk angioplasty followed by left femoral-popliteal aneurysm repair and stenting. Postoperative recovery was uneventful apart from transient acute kidney injury. This case illustrates the diagnostic and therapeutic challenges of complex PAD, highlights the evolving role of multilevel endovascular interventions, and contextualizes decision-making with current evidence and guidelines.

KEYWORDS: Aneurysmal disease, Angioplasty, Endovascular revascularization, Multilevel intervention, Peripheral arterial disease, Stenting

INTRODUCTION

Peripheral arterial disease affects more than 200 million individuals worldwide and is associated with significant morbidity and mortality from limb ischemia and cardiovascular events [1]. While atherosclerotic stenoses of the femoropopliteal and tibial segments are common, concomitant aneurysmal disease adds procedural complexity and raises considerations regarding intervention timing, durability, and risk of complications [2].

Endovascular therapy has increasingly become first-line management for complex multilevel disease, including below-the-knee interventions, due to advances in balloon angioplasty, stenting technology, and perioperative medical therapy [3-5]. Multilevel interventions, particularly tibial angioplasty combined with femoral or popliteal interventions, require meticulous technique and a tailored perioperative approach. We present a case of advanced PAD with popliteal aneurysm and severe tibial disease managed through staged endovascular interventions, illustrating both clinical decision-making and technical aspects.

CASE PRESENTATION

Patient Information and History

A 78-year-old male with a past medical history of coronary artery disease status post percutaneous coronary intervention (5 years prior), hypertension, hyperlipidemia, bilateral PAD, and gangrene presented for evaluation following an abnormal stress test obtained during preoperative cardiac clearance. He denied tobacco, alcohol, or illicit drug use. Family history was notable for pneumoconiosis and silicosis in his father. Medications included aspirin, metoprolol, losartan, statin therapy, and alirocumab. He reported bilateral lower extremity pain, right greater than left.

Investigations

Noninvasive testing and stress imaging raised suspicion for peripheral vascular disease. Arteriography performed via left common femoral access revealed patent iliac segments but significant disease in the popliteal and tibial vessels. Notably, there was a large popliteal aneurysm at the knee level, with >90% stenosis of the anterior tibial artery origin, 70–80% stenosis of the tibioperoneal trunk, and 50–60% stenosis of the posterior tibial artery.

First Intervention

Under general anesthesia, the patient underwent multilevel angioplasty of the right anterior tibial artery (3×40 mm balloon, then 4×40 mm), tibioperoneal trunk, and posterior tibial artery using a 4×40 mm balloon. Following successful angioplasty, improved

flow was demonstrated to the foot via both posterior tibial and anterior tibial arteries. Papaverine was administered intra-arterially. There were no intraoperative complications, estimated blood loss was 100 mL, and postoperative DP and PT pulses were palpable.

Second Intervention

The patient subsequently underwent left lower extremity intervention for femoral-popliteal aneurysmal disease and tibio-peroneal trunk stenosis. Under ultrasound guidance, the artery was cannulated and upsized to an 8F sheath. Angiography demonstrated multiple stenoses in the femoropopliteal segment. An 8×50 mm Viabahn stent was successfully deployed following angioplasty with a 7×200 mm Ranger drug-coated balloon. An initial 10×50 mm stent could not be deployed due to material resistance and was removed. Hemostasis was achieved with an Angio-Seal device. There were no complications.

Hospital Course

Following the second intervention, the patient was admitted to the surgical ICU for overnight observation. He was managed with dual antiplatelet therapy (aspirin and clopidogrel), pain control, IV fluids, and routine labs. A mild postoperative acute kidney injury (elevated creatinine) was observed and resolved with hydration. There were no bleeding complications. He remained hemodynamically stable, and vascular surgery cleared him for discharge the following day.

Discharge and Follow-Up

The patient was discharged home in stable condition on aspirin, clopidogrel, statin therapy, and his home cardiovascular medications. He was scheduled for follow-up with vascular surgery in one week. Functional status was independent at discharge.

DISCUSSION

This case illustrates the management of complex, multilevel PAD with concomitant aneurysmal disease, highlighting both diagnostic strategy and technical execution within evidence-based frameworks.

Clinical Decision-Making:

Current guidelines recommend initial noninvasive testing (ABI, duplex) followed by angiography for definitive planning in patients with suspected PAD and symptoms or abnormal studies [6]. Our patient was identified during cardiac clearance, underscoring the overlap between coronary and peripheral vascular disease and the importance of integrated cardiovascular evaluation [7].

Endovascular-first strategies are effective for multilevel disease, including infrapopliteal segments, particularly in patients with high surgical risk or significant comorbidities [8,9]. The choice of staged interventions, addressing the right tibial vessels first, followed by left femoropopliteal aneurysmal repair, was guided by anatomical findings, procedural complexity, and renal considerations.

Technical Aspects:

Tibial angioplasty requires careful selection of balloon size, pressure, and inflation duration to minimize dissection or recoil. Drug-coated balloons and covered stents have improved patency rates in femoropopliteal lesions, though durability in tibial segments remains more limited [10-12]. In this case, multivessel tibial angioplasty achieved excellent runoff, followed weeks later by aneurysm exclusion and treatment of left-sided stenoses.

Literature Context:

The BASIL and BEST-CLI trials have informed the evolving paradigm for revascularization, showing that endovascular therapy is increasingly favored for selected patients, especially those with high surgical risk and focal lesions [13, 14]. Drug-coated balloon angioplasty and covered stents have demonstrated non-inferior or superior outcomes compared to plain balloon angioplasty or surgical bypass in certain lesion subsets [15,16]. Careful patient selection, meticulous technique, and optimized medical therapy are critical to achieving durable outcomes.

CONCLUSION

This case underscores the importance of a multidisciplinary, staged approach to advanced PAD with multilevel stenoses and aneurysmal disease. Timely diagnosis during cardiac clearance, adherence to endovascular best practices, and appropriate postoperative management resulted in successful revascularization and recovery. As endovascular technologies evolve, individualized strategies integrating anatomical complexity, comorbidities, and guideline-directed therapy are essential to optimize outcomes.

Figure Legends



Figure 1. Diagnostic angiography (pre-intervention).

(A) Lower-extremity runoff demonstrating a popliteal artery aneurysm at the knee with multilevel tibial disease: >90% stenosis at the anterior tibial origin, 70–80% stenosis of the tibioperoneal trunk, and 50–60% stenosis of the posterior tibial artery. (B) Below-knee images showing poor distal runoff/perfusion prior to revascularization.



Figure 2. Post-tibial intervention angiography (right leg).

Final angiogram after multivessel tibial angioplasty (anterior tibial 3×40 mm then 4×40 mm; tibioperoneal trunk/posterior tibial 4×40 mm) demonstrating restored distal perfusion with improved runoff via both the anterior and posterior tibial arteries.

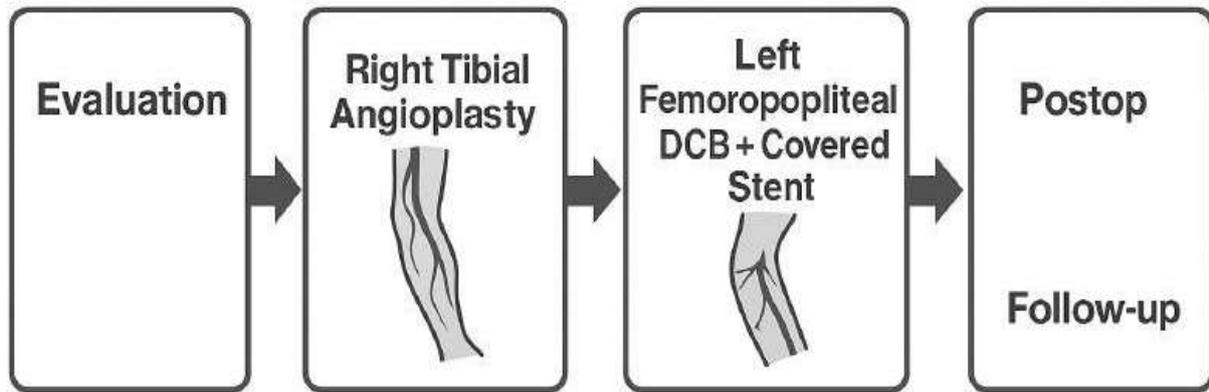


Figure 3. Case timeline.

Schematic summarizing evaluation, staged endovascular interventions (right tibial revascularization followed by left femoropopliteal repair with drug-coated balloon angioplasty and 8×50 mm covered stent), immediate postoperative course, and follow-up milestones.

REFERENCES

1. Fowkes FG, Rudan D, Rudan I, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. *Lancet*. 2013;382(9901):1329–1340.
2. Crawford JD, Perrone KH, Wong VW, et al. A modern series of popliteal artery aneurysms: repair and outcomes. *J Vasc Surg*. 2014;59(1):77–83.
3. Conte MS, Bradbury AW, Kolh P, et al. Global Vascular Guidelines on the management of chronic limb-threatening ischemia. *J Vasc Surg*. 2019;69(6S):S3–S125.e40.
4. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg*. 2007;45(Suppl S):S5–S67.
5. Rocha-Singh KJ, Zeller T, Jaff MR. Peripheral arterial calcification: prevalence, mechanism, detection, and clinical implications. *Catheter Cardiovasc Interv*. 2014;83(6):E212–E220.
6. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC guideline on the management of patients with lower extremity peripheral artery disease. *J Am Coll Cardiol*. 2017;69(11):e71–e126.
7. Criqui MH, Aboyans V. Epidemiology of peripheral artery disease. *Circ Res*. 2015;116(9):1509–1526.
8. Farber A, Menard MT. Endovascular intervention for peripheral artery disease. *Circ Res*. 2021;128(12):1882–1902.
9. Zeller T, Baumgartner I, Scheinert D, et al. Drug-eluting balloon versus standard balloon angioplasty for infrapopliteal arterial revascularization in critical limb ischemia: 12-month results. *Circulation*. 2014;129(9):926–933.
10. Dake MD, Ansel GM, Jaff MR, et al. Durable clinical effectiveness with paclitaxel-eluting stents in the femoropopliteal artery: 5-year results of the Zilver PTX randomized trial. *Circulation*. 2016;133(15):1472–1483.
11. Armstrong EJ, Anderson DR, Yeo KK, et al. Endovascular intervention for critical limb ischemia. *Circ Cardiovasc Interv*. 2014;7(5):646–653.
12. Katsanos K, Spiliopoulos S, Kitrou P, et al. Risk of death following application of paclitaxel-coated balloons and stents in the femoropopliteal artery: a systematic review and meta-analysis. *JAMA*. 2018;319(23):2373–2383.
13. Bradbury AW, Adam DJ, Bell J, et al. Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial. *Lancet*. 2005;366(9501):1925–1934.
14. Farber A, Menard MT, Conte MS, et al. Surgery or endovascular therapy for chronic limb-threatening ischemia. *N Engl J Med*. 2022;387:2305–2316.



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15. Zeller T, Rastan A, Macharzina R, et al. Drug-eluting balloons for treatment of femoropopliteal lesions: 24-month results from the randomized LEVANT 2 trial. *J Am Coll Cardiol.* 2014;64(15):1561–1570.
 16. Bosiers M, Deloose K, Callaert J, et al. Supera stent outcomes in the superficial femoral and proximal popliteal artery in the real world: 12-month results from the SUPERB trial. *J Endovasc Ther.* 2015;22(6):701–707.