

Chapter 15

SURGICAL TREATMENT OF FEMOROPOPLITEAL DISEASE: CURRENT APPROCHES

Özgür GÜRSU¹

Introduction

Peripheral arterial disease (PAD) is the preferred clinical term to explain stenotic, occlusive, and aneurysmal diseases of the aorta and its branch arteries. Peripheral arterial disease arises primarily as a result of atherosclerosis and thrombo-embolic pathophysiological processes that alter the normal structure and function of the aorta, its visceral arterial branches, and the arteries of the lower extremity (1). The prevalence of PAD has been increasing along with the increase of aged populations in most developed countries (2). PAD affects a large segment of the adult population, with an age-adjusted prevalence of 4% to 15%, affecting more than 5 million adults in the United States (3) and increasing up to 30% with age (Figure 1). Although the most common symptom of PAD is intermittent claudication only less than 20% of patients with PAD have typical symptoms of intermittent claudication i.e., legmuscle discomfort on exertion that is relieved by rest with in 10 minutes. More extreme presentations of PAD include rest pain, tissue loss, or gangrene; these limb-threatening manifestations of PAD are collectively termed critical limb ischemia (CLI).

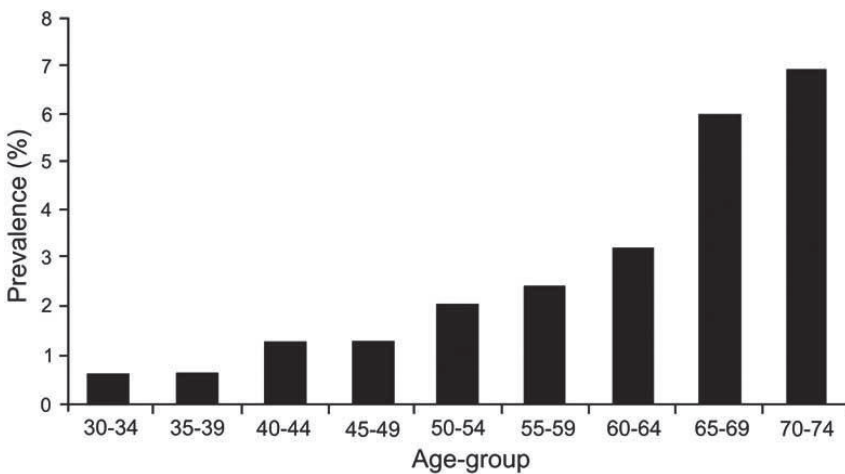


Figure 1: Weighted mean prevalence of intermittent claudication (symptomatic PAD) in large population-based studies. Reproduced with permission from (2)

¹Bahçeşehir University School of Medicine, Department of Cardiovascular Surgery, Istanbul, Turkey

References

1. Hirsch AT, Haskal ZJ, Hertzler NR, Bakal CW, Creager MA, Halperin JL, et al. ACC/AHA Guidelines for the Management of Patients with Peripheral Arterial Disease (lower extremity, renal, mesenteric, and abdominal aortic): a collaborative report from the American Associations for Vascular Surgery/Society for Vascular Surgery/Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (writing committee to develop guidelines for the management of patients with peripheral arterial disease)--summary of recommendations. *J Vasc Interv Radiol.* 2006;17(9):1383-97.
2. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *Eur J Vasc Endovasc Surg* 2007; 33 (Suppl 1): S1-75.
3. Pasternak RC, Criqui MH, Benjamin EJ, et al. Atherosclerotic Vascular Disease Conference: Writing Group I: epidemiology. *Circulation* 2004; 109: 2605-12.
4. Fowkes FG, Housley E, Cawood EH, Macintyre CC, Ruckley CV, Prescott RJ. Edinburgh Artery Study: prevalence of asymptomatic and symptomatic peripheral arterial disease in the general population. *Int J Epidemiol* 1991; 20: 384-92.
5. Aboyans V, Criqui MH, Abraham P, et al. Measurement and interpretation of the ankle-brachial index: a scientific statement from the American Heart Association. *Circulation.* 2012;126:2890-909
6. Rac-Albu M, Lliuta L, Guberna SM, Sinescu C. The role of ankle-brachial index for predicting peripheral arterial disease. *Maedica (Buchar).* 2014 Sep. 9(3):295-302.
7. Karacagil S, Lofberg AM, Granbo A, Lorelius LE, Bergqvist D. Value of duplex scanning in evaluation of crural and foot arteries in limbs with severe lower limb ischaemia: a prospective comparison with angiography. *Eur J Vasc Endovasc Surg* 1996;12:300-303.
8. Gooding GA, Perez S, Rapp JH, Krupski WC. Lower-extremity vascular grafts placed for peripheral vascular disease: prospective evaluation with duplex Doppler sonography. *Radiology* 1991;180:379-386.
9. Flanigan DP, Ballard JL, Robinson D, Galliano M, Blecker G, Harward TR. Duplex ultrasound of the superficial femoral artery is a better screening tool than ankle-brachial index to identify at risk patients with lower extremity atherosclerosis. *J Vasc Surg* 2008;47:789-792.
10. Mishra A, Jain N, Bhagwat A. CT Angiography of Peripheral Arterial Disease by 256-Slice Scanner: Accuracy, Advantages and Disadvantages Compared to Digital Subtraction Angiography. *Vasc Endovascular Surg.* 2017 Jul;51(5):247-254. doi: 10.1177/1538574417698906
11. Leng GC, Lee AJ, Fowkes FG, et al. Incidence, natural history and cardiovascular events in symptomatic and asymptomatic peripheral arterial disease in the general population. *Int J Epidemiol.* 1996;25:1172-81.
12. Dormandy J, Mahir M, Ascady G, et al. Fate of the patient with chronic leg ischaemia. A review article. *J Cardiovasc Surg (Torino).* 1989;30:50-57.
13. Jelnes R, Gaardsting O, Hougaard Jensen K, et al. Fate in intermittent claudication: outcome and risk factors. *Br Med J (Clin Res Ed).* 1986;293:1137-40.
14. Bloor K. Natural history of arteriosclerosis of the lower extremities: Hunterian lecture delivered at the Royal College of Surgeons of England on 22nd April 1960. *Ann R Coll Surg Engl.* 1961;28:36-52.
15. Writing Committee Members, Gerhard-Herman MD, Gornik HL, et al. 2016 AHA/ACC Guideline on the Management of Patients With Lower Extremity Peripheral Artery Disease: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation.* 2017;135(12):e686-e725. doi:10.1161/CIR.0000000000000470.
16. Löfberg AM, Karacagil S, Ljungman C, et al. Percutaneous transluminal angioplasty of the femoropopliteal arteries in limbs with chronic critical lower limb ischemia. *J Vasc Surg.* 2001;34:114-21.
17. Capek P, McLean GK, Berkowitz HD. Femoropopliteal angioplasty. Factors influencing long-term success. *Circulation.* 1991;83:170-80.
18. Clark TW, Groffsky JL, Soulen MC. Predictors of long-term patency after femoropopliteal angioplasty: results from the STAR registry. *J Vasc Interv Radiol.* 2001;12:923-33.
19. Johnston KW, Rae M, Hogg-Johnston SA, et al. 5-year results of a prospective study of percutaneous transluminal angioplasty. *Ann Surg.* 1987;206:403-13.
20. Twine CP, McLain AD. Graft type for femoro-popliteal bypass surgery. *Cochrane Database Syst Rev.* 2010:CD001487.

21. Pereira CE, Albers M, Romiti M, et al. Meta-analysis of femoro- popliteal bypass grafts for lower extremity arterial insufficiency. *J Vasc Surg.* 2006;44:510-7.
22. Goodney PP, Travis LL, Nallamothu BK, et al. Variation in the use of lower extremity vascular procedures for critical limb ischemia. *Circ Cardiovasc Qual Outcomes* 2012;5:94-102.
23. Brass EP, Anthony R, Dormandy J, Hiatt WR, Jiao J, Nakanishi A, McNamara T, Nehler M; Circulase Investigators. Parenteral therapy with lipo-ecraprost, a lipid-based formulation of a PGE1 analog, does not alter six-month outcomes in patients with critical leg ischemia. *J Vasc Surg.* 2006;43:752-759. doi: 10.1016/j.jvs.2005.11.041.
24. Cantelmo NL, Snow JR, Menzoian JO, LoGefro FW. Successful vein bypass in patients with ischemic limb and a palpable popliteal pulse. *Arch Surg* 1986;121:217-220.
25. Schuler JJ, Flanigan DP, Williams LR, Ryan TJ, Castronuovo JJ. Early experience with popliteal to infrapopliteal bypass from limb salvage. *Arch Surg* 1983;118:472-476.
26. Berkowitz HD, Greenstein SM. Improved patency in reversed femoral-infrapopliteal autogenous vein grafts by early detection and treatment of the failing graft. *J Vasc Surg* 1987;5:755-761.
27. Dalsing MC, White JV, Yao JS, Podrazik R, Flinn WR, Bergan JJ. Infrapopliteal bypass for established gangrene of the forefoot or toes. *J Vasc Surg* 1985;2:669-677.
28. Raftery KB, Belkin M, Mackey WC, O'Donnell TF. Are peroneal artery bypass grafts hemodynamically inferior to other tibial artery bypass grafts? *J vasc Surg* 1994;19:964-968; discussion 968-969.
29. A. Schanzer, N. Hevelone, C.D. Owens, M. Belkin, D.F. Bandyk, A.W. Clowes, et al. Technical factors affecting autogenous vein graft failure: observations from a large multicenter trial. *J Vasc Surg*, 46 (2007), pp. 1180-1190
30. Adam DJ, Beard JD, Cleveland T, et al. Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial. *Lancet.* 2005;366:1925-34.
31. Bradbury AW, Adam DJ, Bell J, et al. Multicentre randomised controlled trial of the clinical and cost-effectiveness of a bypass- surgery-first versus a balloon-angioplasty-first revascularisation strategy for severe limb ischaemia due to infrainguinal disease. The Bypass versus Angioplasty in Severe Ischaemia of the Leg (BASIL) trial. *Health Technol Assess.* 2010;14:1-210iii-iv.
32. Popplewell MA, Davies H, Jarrett H, et al. Bypass versus angio plasty in severe ischaemia of the leg - 2 (BASIL-2) trial: study pro- tocol for a randomised controlled trial. *Trials.* 2016;17:11.
33. Vartanian SM, Conte MS. Surgical Intervention for Peripheral Arterial Disease. *Circ Res.* 2015 Apr 24;116(9):1614-28. doi: 10.1161/CIRCRESAHA.116.303504.