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Basic Data Related to Operative Infrainguinal Revascularization Procedures: A Twenty Year Update

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Abstract

In 1990, Dalman and Taylor published a compilation of reported data they identified as related to infrainguinal revascularization procedures in peripheral vascular surgery during the decade of the 1980s. The intervening 20 years has seen revolutionary advances in the field of Peripheral Vascular Surgery, especially in the adoption of endovascular techniques, and an explosion of data related to emerging technologies in the field of infrainguinal revascularization. The tables in this manuscript reflect the evolution of our surgical knowledge during the turn of the 21st century. The superior patency of autologous saphenous vein in all positions is reaffirmed.

In 1990, Dalman and Taylor[1] published a compilation of reported data they identified as related to infrainguinal revascularization procedures in peripheral vascular surgery during the decade of the 1980s. The intervening 20 years has seen revolutionary advances in the field of Peripheral Vascular Surgery, especially in the adoption of endovascular techniques, and an explosion of data related to emerging technologies in the field of infrainguinal revascularization. The tables that follow reflect the evolution of our surgical knowledge during the turn of the 21st century; for example, having reached a consensus on the basic equivalency of the reversed and in-situ techniques in using saphenous vein as a graft conduit, the relevant tables contain only “autologous saphenous vein” as a data category. Likewise, the data reflects the expanded use of polytetrafluoroethylene, the variable levels of inflow for distal bypass, and the availability of long-term outcome data after bypass.

This article incorporates all series published in English from 1990 to 2009, as identified in the PubMed database and retrieved from the Yale University Medical Library, from which performance data on primary infrainguinal revascularization could be extracted. We specifically excluded data that focused on reoperative interventions. The individual data points in these tables are derived from the weighted averages of the recovered Kaplan-Meier data. There were no statistical corrections performed on the reported data; the

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inconsistencies between individual points reflect the variation of patient outcomes and time interval seen between all relevant published studies; Dalman and Taylor noted similar difficulties in compiling their data from multiple publications of varying detail 20 years ago.

As presented in the tables, the primary patency category includes “assisted primary patency” when reported as such; “secondary patency” is defined as the patency of the graft after a secondary procedure to re-establish flow. “Distal adjunct” encompasses all procedures designed to increase distal graft flow, e.g. distal venous patches, Miller cuffs, arteriovenous fistulae.

References

1. Dalman RL, Taylor LM. Basic Data Related to Infrainguinal Revascularization Procedures. *Annals of Vascular Surgery*. 1990; 4(3):309–12. [PubMed: 2140272]
2. Watelet J, Soury P, Menard JF, Plissonnier D, Peillon C, Lestrat JP, Testart J. Femoropopliteal Bypass: In Situ or Reversed Vein Grafts? Ten-Year Results of a Randomized Prospective Study. *Ann Vasc Surg*. 1997; 11:510–519. [PubMed: 9302064]
3. Jackson MR, Belott TP, Dickason T, Kaiser WJ, Modrall JG, Valentine RJ, Clagett GP. The consequences of a failed femoropopliteal bypass grafting: Comparison of saphenous vein and PTFE grafts. *J Vasc Surg*. 2000; 32:498–505. [PubMed: 10957656]
4. Lawson JA, Tangelder MJD, Algra A, Eikelboom BC. The Myth of the *In Situ* Graft: Superiority in Infrainguinal Bypass Surgery? *Eur J Vasc Endovasc Surg*. 1999; 18:149–157. [PubMed: 10428752]
5. Kram HB, Gupta SK, Veith FJ, Wengerter KR, Panetta TF, Nwosisi C. Late results of two hundred seventeen femoropopliteal bypasses to isolated popliteal artery segments. *J Vasc Surg*. 1991; 14(3): 386–390. [PubMed: 1880847]
6. Maini BS, Orr RK, O’Mara P, Hendershott T. Outcome and Resource Utilization in a Managed Care Setting for Lower Extremity Vein Bypass Grafts. *Am J Surg*. 1996; 172:113–117. [PubMed: 8795510]
7. Kretschmer G, Herbst F, Prager M, Sautner T, Wenzl E, Berlakovich GA, Zekert F, Marosi L, Schemper M. A Decade of Oral Anticoagulant Treatment to Maintain Autologous Vein Grafts for Femoropopliteal Atherosclerosis. *Arch Surg*. 1992; 127:1112–1115. [PubMed: 1514915]
8. Chapleau D, Lassonde J, Blair JF, Laurendeau F. In situ femoro-popliteal bypass grafts. Study of 85 cases using Cartier’s technique. *French Ann Chir*. 1991; 45(9):751–5.
9. Moody AP, Edwards PR, Harris PL. In situ versus reversed femoropopliteal vein grafts: long-term follow-up of a prospective, randomized trial. *Br J Surg*. 1992; 79(8):750–2. [PubMed: 1393459]
10. Franks PJ, Sian M, Kenchington GF, Alexander CE, Powell TJ. Aspirin usage and its influence on femoro-popliteal vein graft patency. The Femoro-popliteal Bypass Trial Participants. *Eur J Vasc Surg*. 1992; 6(2):185–8. [PubMed: 1572459]
11. Mills JL, Taylor SM. Results of infrainguinal revascularization with reversed vein conduits: a modern control series. *Ann Vasc Surg*. 1991; 5(2):156–162. [PubMed: 2015186]
12. John TG, Stonebridge PA, Kelman J, Murie JA, Jenkins AmcL, Ruckley CV. Above-knee femoropopliteal bypass grafts and the consequences of graft failure. *Ann R Coll Surg Engl*. 1993; 75:257–260. [PubMed: 8379629]
13. Berlakovich GA, Herbst F, Mittbock M, Kretschmer G. The Choice of Material for Above-Knee Femoropopliteal Bypass: A 20-Year Experience. *Arch Surg*. 1994; 129:297–302. [PubMed: 8129607]
14. Kobayashi M, Hida K, Shikata H, Sakamoto A, Matsubara J. Long Term Outcome of Femoropopliteal Bypass for Claudication and Critical Ischemia. *Asian Cardiovasc Thorac Ann*. 2004; 12:208–212. [PubMed: 15353457]
15. Daenens K, Schepers S, Fourneau I, Houthoofd S, Nevelsteen A. Heparin-bonded ePTFE grafts compared with vein grafts in femoropopliteal and femorocrural bypasses: 1- and 2-year results. *J Vasc Surg*. 2009; 49:1210–6. [PubMed: 19394550]
16. Johnson WC, Lee KK. A comparative evaluation of polytetrafluoroethylene, umbilical vein, and saphenous vein bypass grafts for femoral-popliteal above-knee revascularization: A prospective

- randomized Department of Veterans Affairs cooperative study. *J Vasc Surg.* 2000; 32:268–77. [PubMed: 10917986]
17. Ballotta E, Renon L, Toffano M, Da Giau G. Prospective randomized study on bilateral above-knee femoropopliteal revascularization: Polytetrafluoroethylene graft versus reversed saphenous vein. *J Vasc Surg.* 2003; 38:1051–5. [PubMed: 14603216]
 18. Klinkert P, Schepers A, Burger DH, van Bockel JH, Breslau PJ. Vein versus polytetrafluoroethylene in above-knee femoropopliteal bypass grafting: Five-year results of a randomized control trial. *J Vasc Surg.* 2003; 37:149–55. [PubMed: 12514593]
 19. Shah DM, Darling RC III, Chang BB, Fitzgerald KM, Paty PSK, Leather RP. Long-Term Results of *In Situ* Saphenous Vein Bypass. *Annals of Surgery.* 1995; 222(4):438–448. [PubMed: 7574925]
 20. Tofigh AM, Warnier De Wailly G, Rhissassi B. Comparing vein with collagen impregnated woven polyester prosthesis in above-knee femoropopliteal bypass grafting. *Int J Surg.* 2007; 5(2):109–113. [PubMed: 17448975]
 21. Archie JP Jr. Femoropopliteal bypass with either adequate ipsilateral reversed saphenous vein or obligatory polytetrafluoroethylene. *Ann Vasc Surg.* 1994; 8(5):475–84. [PubMed: 7811585]
 22. AbuRahma AF, Robinson PA, Holt SM. Prospective controlled study of polytetrafluoroethylene versus saphenous vein in claudicant patients with bilateral above knee femoropopliteal bypasses. *Surgery.* 1999; 126(4):594–601. [PubMed: 10520903]
 23. Sala F, Hassen-Khodja R, Lecis A, Bouillanne PJ, Declémy S, Batt M. Long-term outcome of femoral above-knee popliteal artery bypass using autologous saphenous vein versus expanded polytetrafluoroethylene grafts. *Ann Vasc Surg.* 2003; 17(4):401–7. [PubMed: 14670018]
 24. De Luccia N, Brochado-Neto FC, Romiti M, Kikuchi M, dos Reis JMC, Durazzo AES, Albers MTV. Preferential use of nonreversed vein grafts in above-knee femoropopliteal bypasses for critical ischemia: midterm outcome. *Annals of Vascular Surgery.* 2008; 22(5):668–75. [PubMed: 18579342]
 25. Plecha EJ, Freischlag JA, Seabrook GR, Towne JB. Femoropopliteal bypass revisited: an analysis of 138 cases. *Cardiovascular Surgery.* 1996; 4(2):195–199. [PubMed: 8861436]
 26. Z'graggen K, Inderbitzi R, Krebs T, Stirnemann P. The value of supragenicular femoro-popliteal polytetrafluoroethylene prosthesis in surgical treatment of chronic arterial occlusive disease. *German Vasa.* 1990; 19(4):311–4.
 27. Budd JS, Brennan J, Beard JD, Warren H, Burton PR, Bell PR. Infrainguinal bypass surgery: factors determining late graft patency. *Br J Surg.* 1990; 77(12):1382–7. [PubMed: 2135167]
 28. Achermann A, Gurke L, Stirnemann P. Supragenicular bypass: venous in comparison with synthetic prosthesis (PTFE). *German Swiss Surg.* 1998; 4(3):129–32.
 29. Taylor LM, Edwards JM, Porter JM. Present status of reversed vein bypass grafting: Five-year results of a modern series. *J Vasc Surg.* 1990; 11(2):193–206. [PubMed: 2299743]
 30. Curi MA, Skelly CL, Meyerson SL, Woo DH, Desai TR, McKinsey JF, Bassiouny HS, Katz D, Gewertz BL, Schwartz LB. Conduit choice for above-knee femoropopliteal bypass grafting in patients with limb-threatening ischemia. *Ann Vasc Surg.* 2002; 16(1):95–101. [PubMed: 11904812]
 31. Macaulay EM, Samy AK, Cooper GG. Infragenicular vein bypass graft for critical limb ischaemia: one surgeon's experience. *J R Coll Surg Edinb.* 1996; 41(6):391–4. [PubMed: 8997026]
 32. Enzler M, Sege D, Nagel W, Clerici T. Results of in situ bypass. *German Helv Chir Acta.* 1991; 57(5):759–64.
 33. Allen BT, Reilly JM, Rubin BG, Thompson RW, Anderson CB, Flye MW, Sicard GA. Femoropopliteal bypass for claudication: vein vs. PTFE. *Ann Vasc Surg.* 1996; 10(2):178–85. [PubMed: 8733871]
 34. Lau H, Cheng SW. Long-term prognosis of femoropopliteal bypass: an analysis of 349 consecutive revascularizations. *ANZ J Surg.* 2001; 71(6):335–40. [PubMed: 11409017]
 35. Aune S, Laxdal E. Above-knee Prosthetic Femoropopliteal Bypass for Intermittent Claudication. Results of the Initial and Secondary Procedures. *Eur J Vasc Endovasc Surg.* 2000; 19:476–480. [PubMed: 10828227]

36. Post S, Kraus T, Muller-Reinartz U, Weiss C, Kortmann H, Quentmeier A, Winkler M, Husfeldt KJ, Allenberg JR. Dacron vs Polytetrafluoroethylene Grafts for Femoropopliteal Bypass: a Prospective Randomised Multicentre Trial. *Eur J Vasc Endovasc Surg.* 2001; 22:226–231. [PubMed: 11506515]
37. Bosiers M, Deloosse K, Verbist J, Schroe Hj, Lauwers G, Lansink W, Peeters P. Heparin-bonded expanded polytetrafluoroethylene vascular graft for femoropopliteal and femorocrural bypass grafting: 1-year results. *J Vasc Surg.* 2006; 43:313–319. [PubMed: 16476607]
38. Jensen LP, Lepantalo M, Fosssdal JE, Roder OC, Jensen BS, Madsen MS, Grenager O, Fating H, Myhre HO, Baekgaard N, Nielsen OM, Helgstrand U, Schroeder TV. Dacron or PTFE for Above-knee Femoropopliteal Bypass. A Multicenter Randomised Study. *Eur J Vasc Endovasc Surg.* 2007; 34:44–49. [PubMed: 17400486]
39. Prendiville EJ, Yeager A, O'Donnell TF Jr, Coleman JC, Jaworek A, Callow AD, Mackey WC, Deterling RA. Long-term results with the above-knee popliteal expanded polytetrafluoroethylene graft. *J Vasc Surg.* 1990; 11(4):517–24. [PubMed: 2325212]
40. Patterson RB, Fowl RJ, Kempczinski RF, Gewirtz R, Shukla R. Preferential use of EPTFE for above-knee femoropopliteal bypass grafts. *Ann Vasc Surg.* 1990; 4(4):338–43. [PubMed: 2364049]
41. O'Riordain DS, Buckley DJ, O'Donnell JA. Polytetrafluoroethylene in above-knee arterial bypass surgery for critical ischemia. *Am J Surg.* 1992; 164(2):129–31. [PubMed: 1636892]
42. Aalders GJ, van Vroonhoven TJ. Polytetrafluoroethylene versus human umbilical vein in above-knee femoropopliteal bypass: six-year results of a randomized clinical trial. *J Vasc Surg.* 1992; 16(6):816–24. [PubMed: 1460707]
43. Zempo N, Esato K, O-Hara M, Fujioka K, Kuga T, Takenaka H. Is the preferential use of polytetrafluoroethylene grafts for below-knee femoropopliteal bypass justified? *Int Surg.* 1993; 78(2):162–5. [PubMed: 8354618]
44. Green RM, Abbott WM, Matsumoto T, Wheeler JR, Miller N, Veith FJ, Money S, Garrett HE. Prosthetic above-knee femoropopliteal bypass grafting: five-year results of a randomized trial. *J Vasc Surg.* 2000; 31(3):417–25. [PubMed: 10709052]
45. Kavanagh EG, O'Riordain DS, Buckley DJ, O'Donnell JA. Long term results of polytetrafluoroethylene in above knee femoropopliteal bypass for critical ischemia. *Ir J Med Sci.* 1998; 167(4):221–4. [PubMed: 9868858]
46. Miyazaki K, Nishibe T, Sata F, Miyazaki YI, Kudo FA, Flores J, Yasuda K. Prosthetic grafts for above-knee femoropopliteal bypass. A multicenter retrospective study of 564 grafts. *Int Angiol.* 2002; 21(2):145–51. [PubMed: 12110775]
47. Peeters P, Verbist J, Deloosse K, Bosiers M. Results with heparin bonded polytetrafluoroethylene grafts for femorodistal bypasses. *J Cardiovasc Surg (Torino).* 2006; 47(4):407–13.
48. Hugl B, Nevelsteen A, Daenens K, Perez MA, Heider P, Railo M, Schelzig H, Gluecklich B, Balzer K, Vermassen F, De Smit P, Fraedrich G. PEPE II – a multicenter study with an end-point heparin-bonded expanded polyfluoroethylene vascular graft for above and below knee bypass surgery: determinants of patency. *J Cardiovasc Surg (Torino).* 2009; 50(2):195–203.
49. Griffiths GD, Nagy J, Black D, Stonebridge PA. Randomized clinical trial of distal anastomotic interposition vein cuff in infrainguinal polytetrafluoroethylene bypass grafting. *British Journal of Surgery.* 2004; 91:560–562. [PubMed: 15122605]
50. Rosenthal D, Evans RD, McKinsey J, Seagraves MA, Lamis PA, Clark MD, Daniel WW. Prosthetic above-knee femoropopliteal bypass for intermittent claudication. *J Cardiovasc Surg (Torino).* 1990; 31(4):462–8.
51. Gupta SK, Veith FJ, Kram HB, Wengerter KR. Prospective, randomized comparison of ringed and nonringed polytetrafluoroethylene femoropopliteal bypass grafts: a preliminary report. *J Vasc Surg.* 1991; 13(1):163–72. [PubMed: 1987388]
52. Davies MG, Feeley TM, O'Malley MK, Colgan MP, Moore DJ, Shanik GD. Infrainguinal polytetrafluoroethylene grafts: saved limbs or wasted effort? A report on ten years' experience. *Ann Vasc Surg.* 1991; 5(6):519–24. [PubMed: 1772757]

53. Quinones-Baldrich WJ, Prego AA, Ucelay-Gomez R, Freischlag JA, Ahn SS, Baker JD, Machleder HI, Moore WS. Long-term results of infrainguinal revascularization with polytetrafluoroethylene: a ten-year experience. *J Vasc Surg.* 1992; 16(2):209–217. [PubMed: 1495144]
54. El-Kayali AA. Polytetrafluoroethylene use for above-knee femoropopliteal bypass in critical limb ischemia. *Saudi Med J.* 2003; 24(6):669–71. [PubMed: 12847601]
55. Stonebridge PA, Prescott RJ, Ruckley CV. Randomized trial comparing infrainguinal polytetrafluoroethylene bypass grafting with and without vein interposition cuff at the distal anastomosis. The Joint Vascular Group. *J Vasc Surg.* 1997; 26(4):543–50. [PubMed: 9357453]
56. Raptis S, Miller JH. Influence of a vein cuff on polytetrafluoroethylene grafts for primary femoropopliteal bypass. *Br J Surg.* 1995; 82(4):487–91. [PubMed: 7613892]
57. Robinson BI, Fletcher JP, Tomlinson P, Allen RDM, Hazelton SJ, Richardson AJ, Stuchbery K. A prospective randomized multicentre comparison of expanded polytetrafluoroethylene and gelatin-sealed knitted Dacron grafts for femoropopliteal bypass. *Cardiovascular Surgery.* 1999; 7(2):214–218. [PubMed: 10353674]
58. Devine C, McCollum C. Heparin-bonded Dacron or polytetrafluoroethylene for femoropopliteal bypass: Five-year results of a prospective randomized multicenter clinical trial. *J Vas Surg.* 2004; 40:924–31.
59. Dorigo W, Di Carlo F, Troisi N, Pratesi G, Innocenti AA, Pulli R, Pratesi C. Lower Limb Revascularization with a New Bioactive Prosthetic Graft: Early and Late Results. *Ann Vasc Surg.* 2008; 22:79–87. [PubMed: 18023557]
60. McCollum C, Kenchington G, Alexander C, Franks PJ, Greenhalgh RM. PTFE or HUV for femoro-popliteal bypass: a multi-centre trial. *Eur J Vasc Surg.* 1991; 5(4):435–43. [PubMed: 1915909]
61. Robinson BI, Fletcher JP. Australian and New Zealand Femoropopliteal Graft Trial Participants. Fluoropolymer coated Dacron or polytetrafluoroethylene for femoropopliteal bypass grafting: a multicentre trial. *ANZ J Surg.* 2003; 73(3):95–9. [PubMed: 12608965]
62. Abbott WM, Green RM, Matsumoto T, Wheeler JR, Miller N, Veith FJ, Suggs WD, Hollier L, Money S, Garrett HE. Prosthetic above-knee femoropopliteal bypass grafting: results of a multicenter randomized prospective trial. Above Knee Femoropopliteal Study Group. *J Vasc Surg.* 1997; 25(1):19–28. [PubMed: 9013904]
63. Sommeling CA, Buth J, Jakimowicz JJ. Long-term behavior of modified human umbilical vein grafts; late aneurysmal degeneration established by colour-duplex scanning. *Eur J Vasc Surg.* 1990; 4(1):89–94. [PubMed: 2182346]
64. Sato O, Okamoto H, Takagi A, Miyata T, Takayama Y. Biodegradation of glutaraldehyde-tanned human umbilical vein grafts. *Surg Today.* 1995; 25(10):901–5. [PubMed: 8574057]
65. Dardik H. The second decade of experience with the umbilical vein graft for lower-limb revascularization. *Cardiovascular Surgery.* 1995; 3(3):265–269. [PubMed: 7655839]
66. Batt M, Gagliardi JM, Avril G, Guzman R, Guidoin R, Hassen-Khodja R, Marois M, Le Bas P. Human umbilical vein grafts as infrainguinal bypasses: long term clinical follow-up and pathological investigation of explanted grafts. *Clin Invest Med.* 1990; 13(4):155–64. [PubMed: 2208831]
67. Neufang A, Espinola-Klein C, Dorweiler B, Messow CM, Schmiedt W, Vahl CF. Femoropopliteal prosthetic bypass with glutaraldehyde stabilized human umbilical vein (HUV). *J Vasc Surg.* 2007; 46:280–8. [PubMed: 17600663]
68. Dardik H, Wengerter K, Feng Qin, Pangilinan A, Silvestri F, Wolodiger F, Kahn M, Sussman B, Ibrahim IM. Comparative decades of experience with glutaraldehyde-tanned human umbilical cord vein graft for lower limb revascularization: An analysis of 1275 cases. *J Vasc Surg.* 2002; 35:64–71. [PubMed: 11802134]
69. van Reedt Dortland RW, van Leeuwen MS, Steijling JJ, Theodorides T, van Vroonhoven TJ. Long-term results with vein homograft in femoro-distal arterial reconstructions. *Eur J Vasc Surg.* 1991; 5(5):557–64. [PubMed: 1959685]
70. Farber A, Major K, Wagner WH, Cohen JL, Cossman DV, Lauterbach SR, Levin PM. Cryopreserved saphenous vein allografts in infrainguinal revascularization: Analysis of 240 grafts. *J Vasc Surg.* 2003; 38:15–21. [PubMed: 12844083]

71. Harris L, O'Brien-Irr M, Ricotta JJ. Long-term assessment of cryopreserved vein bypass grafting success. *J Vasc Surg.* 2001; 33:528–32. [PubMed: 11241123]
72. Rebane E, Tikko H, Tunder E, Lepner U, Helberg A, Pulges A, Vaasna T, Suba S, Lieberg J, Tamm V, Ellervee T, Vasar O. Venous allografts for infrainguinal vascular bypass. *Cardiovascular Surgery.* 1997; 5(1):21–25. [PubMed: 9158118]
73. Streinchenberger R, Barjoud H, Adeleine P, Larese A, Nemoz C, Chatelard P, Nedey C, Sabben F, Ganichot F, Jurus C. Venous allografts preserved at 4 degrees C for infrainguinal bypass: long-term results from 170 procedures. *Ann Vasc Surg.* 2000; 14(6):553–60. [PubMed: 11128448]
74. Faries PL, Arora S, Pomposelli FB Jr, Pulling MC, Smakowski P, Rohan DI, Gibbons GW, Akbari CM, Campbell DR, LoGerfo FW. The use of arm vein in lower-extremity revascularization: results of 520 procedures performed in eight years. *J Vasc Surg.* 2000; 31(1):50–9. [PubMed: 10642708]
75. Ballotta E, Renon L, De Rossi A, Barbon B, Terranova O, Da Giau G. Prospective randomized study on reversed saphenous vein infrapopliteal bypass to treat limb-threatening ischemia: Common femoral artery versus superficial femoral or popliteal and tibial arteries as inflow. *J Vasc Surg.* 2004; 40:732–40. [PubMed: 15472602]
76. Damme HV, Zhang L, Baguet E, Creemers E, Albert A, Limet R. Crural Artery Bypass with the Autogenous Greater Saphenous Vein. *Eur J Vasc Endovasc Surg.* 2003; 26:635–642. [PubMed: 14603424]
77. Schneider JR, Walsh DB, McDaniel MD, Zwolak RM, Besso SR, Cronenwett JL. Pedal bypass versus tibial bypass with autogenous vein: a comparison of outcome and hemodynamic results. *J Vasc Surg.* 1993; 17(6):1029–40. [PubMed: 8505781]
78. Conte MS, Belkin M, Donaldson MC, Baum P, Mannick JA, Whittemore AD. Femorotibial bypass for claudication: do results justify an aggressive approach? *J Vasc Surg.* 1995; 21(6):873–80. [PubMed: 7776466]
79. Wengerter KR, Veith FJ, Gupta SK, Goldsmith J, Farrell E, Harris PL, Moore D, Shanik G. Prospective randomized multicenter comparison of in situ and reversed vein infrapopliteal bypasses. *J Vasc Surg.* 1991; 13(2):189–99. [PubMed: 1990160]
80. Brown PS, McCarthy WJ, Yao JST, Pearce WH. The Popliteal Artery as Inflow for Distal Bypass Grafting. *Arch Surg.* 1994; 129:596–602. [PubMed: 8204033]
81. Verhelst R, Bruneau M, Nicolas AL, Frangi R, El Khoury G, Noirhomme P, Dion R. Popliteal-to-Distal Bypass Grafts for Limb Salvage. *Annals of Vascular Surgery.* 1997; 11(5):505–509. [PubMed: 9302063]
82. Goyal A, Shah PM, Babu SC, Mateo RB. Popliteal-crural bypass through the posterior approach with lesser saphenous vein for limb salvage. *J Vasc Surg.* 2002; 36:708–712. [PubMed: 12368730]
83. Mills JL, Gahtan V, Fujitani RM, Taylor SM, Bandyk DF. The utility and durability of vein bypass grafts originating from the popliteal artery for limb salvage. *Am J Surg.* 1994; 168(6):646–51. [PubMed: 7978012]
84. Probst H, Saucy F, Dusmet M, Ris HB, Ducrey N, Haller C, Corpataux JM. Clinical results of autologous infrainguinal revascularization using grafts originating distal to the femoral bifurcation in patients with mild inflow disease. *J Cardiovasc Surg (Torino).* 2006; 47(4):437–43.
85. Grego F, Antonello M, Stramano R, Deriu GP, Lepidi S. Popliteal-to-distal bypass for limb salvage. *Ann Vasc Surg.* 2004; 18(3):321–8. [PubMed: 15354634]
86. Lyon RT, Veith FJ, Marsan BU, Wengerter KR, Panetta TF, Marin ML, Goldsmith J, Rivers SP, Suggs W. Eleven-year experience with tibiotibial bypass: an unusual but effective solution to distal tibial artery occlusive disease and limited autologous vein. *J Vasc Surg.* 1994; 20(1):61–9. [PubMed: 8028091]
87. Sugawara Y, Sato O, Miyata T, Kimura H, Namba T, Makuuchi M. Tibioperoneal bypass for popliteal arterial occlusion. *J Cardiovasc Surg (Torino).* 1998; 39(1):19–23.
88. Abou-Zamzam AM, Moneta GL, Lee RW, Nehler MR, Taylor LM, Porter JM. Peroneal Bypass Is Equivalent to Inframalleolar Bypass for Ischemic Pedal Gangrene. *Arch Surg.* 1996; 131:894–99. [PubMed: 8712916]
89. Anderson CB, Stevens SL, Allen BT, Sicard GA. In situ saphenous vein for lower extremity revascularization. *Surgery.* 1992; 112(1):6–10. [PubMed: 1621226]

90. Brochado-Neto FC, Albers M, Pereira CAB, Gonzalez J, Cinelli M Jr. Prospective Comparison of Arm Veins and Greater Saphenous Veins as Infrageniculate Bypass Grafts. *Eur J Vasc Endovasc Surg.* 2001; 22:146–151. [PubMed: 11472048]
91. Belkin M, Knox J, Donaldson MC, Mannick JA, Whittemore AD. Infringuinal arterial reconstruction with nonreversed greater saphenous vein. *J Vasc Surg.* 1996; 24(6):957–62. [PubMed: 8976349]
92. Londrey GL, Ramsey DE, Hodgson KJ, Barkmeier LD, Sumner DS. Infrapopliteal bypass for severe ischemia: comparison of autogenous vein, composite, and prosthetic grafts. *J Vasc Surg.* 1991; 13(5):631–6. [PubMed: 2027201]
93. Pappas PJ, Hobson RW II, Meyers MG, Jamil Z, Lee BC, Silva MB Jr, Goldberg MC, Padberg FT Jr. Patency of infrainguinal polytetrafluoroethylene bypass grafts with distal interposition vein cuffs. *Cardiovascular Surgery.* 1998; 6(1):19–26. [PubMed: 9546843]
94. Bellosta R, Luzzani L, Carugati C, Melloni C, Sarcina A. Which distal anastomosis should be used in PTFE femoro-tibial bypass? *J Cardiovasc Surg (Torino).* 2005; 46(5):499–503.
95. Morasch MD, Couse NF, Colgan MP, Moore DJ, Shanik GD. Lower Extremity Bypass for Critical Ischemia Using Synthetic Conduit and Adjuvant Vein Cuff. *Ann Vasc Surg.* 1997; 11:242–246. [PubMed: 9140598]
96. Stonebridge PA, Naidu S, Colgan MP, Moore DJ, Shanik DG, McCollum PT. Tibial and peroneal artery bypasses using polytetrafluoroethylene (PTFE) with an interposition vein cuff. *J R Coll Surg Edinb.* 2000; 45(1):17–20. [PubMed: 10815375]
97. Panneton JM, Hollier LH, Hofer JM. Multicenter randomized prospective trial comparing a pre-cuffed polytetrafluoroethylene graft to a vein cuffed polytetrafluoroethylene graft for infragenicular arterial bypass. *Ann Vasc Surg.* 2004; 18(2):199–206. [PubMed: 15253256]
98. Aracil-Sanus E, Mendieta-Azcona C, Cuesta-Gimeno C, Chinchilla-Molina A. Infragenicular bypass graft for limb salvage using polytetrafluoroethylene and distal vein cuff as the first alternative in patients without ipsilateral greater saphenous vein. *Ann Vasc Surg.* 2005; 19(3):379–85. [PubMed: 15864479]
99. Jakobsen HL, Baekgaard N, Christoffersen JK. Below-knee Popliteal and Distal Bypass with PTFE and Vein Cuff. *Eur J Vasc Endovasc Surg.* 1998; 15:327–330. [PubMed: 9610345]
100. Lauterbach SR, Torres GA, Andros G, Oblath RW. Infragenicular Polytetrafluoroethylene Bypass With Distal Vein Cuffs for Limb Salvage: A Contemporary Series. *Arch Surg.* 2005; 140:487–494. [PubMed: 15897445]
101. Kashyap VS, Ahn SS, Quinones-Baldrich WJ, Choi BU, Dorey F, Reil TD, Freischlag JA, Moore WS. Infrapopliteal-Lower Extremity Revascularization with Prosthetic Conduit: A 20-Year Experience. *Vasc Endovasc Surg.* 2002; 36:255–262.
102. Eagleton MJ, Ouriel K, Shortell C, Green RM. Femoral-infrapopliteal bypass with prosthetic grafts. *Surgery.* 1999; 126(4):759–65. [PubMed: 10520926]
103. Ascher E, Scheinman M, Mazzariol F, Kallakuri S, Hingorani A. Comparison between Supra- and Infringuinal Inflow Sites for Infrapopliteal PTFE Bypasses with Complementary Arteriovenous Fistula and Vein Interposition. *Eur J Vasc Endovasc Surg.* 2000; 19:138–142. [PubMed: 10727362]
104. Hingorani AP, Ascher E, Marks NA, Schutzer RW, Mutyala M, Nahata S, Yorkovich W, Kucherina A, Jacob T. A 10-year experience with complementary distal arteriovenous fistula and deep vein interposition for infrapopliteal prosthetic bypasses. *Vasc Endovascular Surg.* 2005; 39(5):401–9. [PubMed: 16193212]
105. Lazarides MK, Tzilalis VD, Georgiadis GS, Georgopoulos SE, Arvanitis DP. Femoral-anterior tibial reconstructions using cuffed PTFE grafts: routing alternatives. *Vasa.* 2003; 32(1):22–5. [PubMed: 12677761]
106. Klinkert P, van Dijk PJ, Breslau PJ. Polytetrafluoroethylene femorotibial bypass grafting: 5-year patency and limb salvage. *Ann Vasc Surg.* 2003; 17(5):486–91. [PubMed: 12958671]
107. Schweiger H, Klein P, Lang W. Tibial bypass grafting for limb salvage with ringed polytetrafluoroethylene prostheses: results of primary and secondary procedures. *J Vasc Surg.* 1993; 18(5):867–74. [PubMed: 8230575]

108. Parsons RE, Suggs WD, Veith FJ, Sanchez LA, Lyon RT, Marin ML, Goldsmith J, Faries PL, Wengerter KR, Schwartz ML. Polytetrafluoroethylene bypasses to infrapopliteal arteries without cuffs or patches: a better option than amputation in patients without autologous vein. *J Vasc Surg.* 1996; 23(2):347–56. [PubMed: 8637113]
109. Calligaro KD, Syrek JR, Dougherty MJ, Rua I, Raviola CA, DeLaurentis DA. Use of arm and lesser saphenous vein compared with prosthetic grafts for infrapopliteal arterial bypass: are they worth the effort? *J Vasc Surg.* 1997;919–27. [PubMed: 9423706]
110. Neville RF, Tempesta B, Sidway AN. Tibial bypass for limb salvage using polytetrafluoroethylene and a distal vein patch. *J Vasc Surg.* 2001; 33(2):266–272. [PubMed: 11174777]
111. Hamdan AD, Rayan SS, Hook SC, Campbell DR, Akbari CM, LoGerfo FW, Pomposelli FB. Bypasses to Tibial Vessels Using Polytetrafluoroethylene as the Solo Conduit in a Predominantly Diabetic Population. *Vasc Endovascular Surg.* 2002; 36(1):59–63. [PubMed: 12704526]
112. Neufang A, Espinola-Klein C, Dorweiler B, Savvidis S, Schmiedt W, Vahl CF. Infrapopliteal Composite Bypass with Autologous Vein and Second Generation Glutaraldehyde Stabilized Human Umbilical Vein (HUV) for Critical Lower Limb Ischaemia. *Eur J Vasc Endovasc Surg.* 2007; 34:583–589. [PubMed: 17574877]
113. Neufang A, Espinola-Klein C, Dorweiler B, Reinstadler J, Pitton M, Savvidis S, Fischer R, Vahl C, Schmiedt W. Sequential Femorodistal Composite Bypass with Second Generation Glutaraldehyde Stabilized Human Umbilical Vein (HUV). *Eur J Vasc Endovasc Surg.* 2005; 30:176–183. [PubMed: 15950502]
114. Batt M, Avril G, Gagliardi JM, Guzman R, Guidoin R, Boas N, Daune B, Hassen-Khodja R, Le Bas P. Femorodistal bypass using the chemically processed human umbilical vein graft: 9-year experience. *Can J Surg.* 1990; 33(1):61–5. [PubMed: 2302603]
115. Moody AP, al Fagih S, Edwards PR, Campbell H, Harris PL. The use of an adjuvant arterio-venous shunt in prosthetic femoro-crural bypass. *Eur J Vasc Surg.* 1991; 5(3):327–32. [PubMed: 1864397]
116. Walker PJ, Mitchell RS, McFadden PM, James DR, Mehigan JT. Early experience with cryopreserved saphenous vein allografts as a conduit for complex limb-salvage procedures. *J Vasc Surg.* 1993; 18(4):561–9. [PubMed: 8411463]
117. Buckley CJ, Abernathy S, Lee SD, Arko FR, Patterson DE, Manning LG. Suggested treatment protocol for improving patency of femoral-infrapopliteal cryopreserved saphenous vein allografts. *J Vasc Surg.* 2000; 32:731–8. [PubMed: 11013037]
118. Carpenter JP, Tomaszewski JE. Immunosuppression for human saphenous vein allograft bypass surgery: A prospective randomized trial. *J Vasc Surg.* 1997; 26:32–42. [PubMed: 9240319]
119. Martin RS III, Edwards WH, Mulherin JL, Edwards WH Jr, Jenkins JM, Hoff SJ. Cryopreserved Saphenous Vein Allografts for Below-Knee Lower Extremity Revascularization. *Annals of Surgery.* 1994; 219(6):664–672. [PubMed: 8203975]
120. De Leersnijder D, Willocx P, Van Marck E, Vanmaele R. Venous homografts in infra-inguinal procedures: an eight years experience. *J Cardiovasc Surg (Torino).* 1992; 33(6):633–40.
121. Posner MP, Makhoul RG, Altman M, Kimball P, Cohen N, Sobel M, Dattilo J, Lee HM. Early results of infrageniculate arterial reconstruction using cryopreserved homograft saphenous conduit (CADVEIN) and combination low-dose systemic immunosuppression. *J Am Coll Surg.* 1996; 183(3):208–16. [PubMed: 8784313]
122. Leseche G, Penna C, Bouttier S, Joubert S, Andreassian B. Femorodistal bypass using cryopreserved venous allografts for limb salvage. *Ann Vasc Surg.* 1997; 11(3):230–6. [PubMed: 9140596]
123. Harris RW, Schneider PA, Andros G, Oblath RW, Salles-Cunha S, Dulawa L. Allograft vein bypass: is it an acceptable alternative for infrapopliteal revascularization? *J Vasc Surg.* 1993; 18(4):553–60. [PubMed: 8411462]
124. Sesto ME, Sullivan TM, Hertzner NR, Krajewski LP, O'Hara PJ, Beven EG. Cephalic vein grafts for lower extremity revascularization. *J Vasc Surg.* 1992; 15(3):543–9. [PubMed: 1538512]
125. Harward TR, Coe D, Flynn TC, Seeger JM. The use of arm vein conduits during infrageniculate arterial bypass. *J Vasc Surg.* 1992; 16(3):420–6. [PubMed: 1522646]

126. Tisi PV, Crow AJ, Shearman CP. Arm vein reconstruction for limb salvage: long-term outcome. *Ann R Coll Surg Engl.* 1996; 78:497–500. [PubMed: 8943631]
127. Armstrong PA, Bandyk DF, Wilson JS, Shames ML, Johnson BL, Back MR. Optimizing infrainguinal arm vein bypass patency with duplex ultrasound surveillance and endovascular therapy. *J Vasc Surg.* 2004; 40:724–31. [PubMed: 15472601]
128. Chalmers RT, Hoballah JJ, Kresowik TF, Sharp WJ, Synn AY, Miller E, Corson JD. The impact of color duplex surveillance on the outcome of lower limb bypass with segments of arm veins. *J Vasc Surg.* 1994; 19(2):279–86. [PubMed: 8114189]
129. Connors JP, Walsh DB, Nelson PR, Powell RJ, Fillinger MF, Zwolak RM, Cronenwett JL. Pedal branch artery bypass: A viable limb salvage option. *J Vasc Surg.* 2000; 32(6):1071–1079. [PubMed: 11107078]
130. Hughes K, Domenig CM, Hamdan AD, Schermerhorn M, Aulivola B, Blattman S, Campbell DR, Scovell SD, LoGerfo FW, Pomposelli FB. Bypass to plantar and tarsal arteries: An acceptable approach to limb salvage. *J Vasc Surg.* 2004; 40(6):1149–1157. [PubMed: 15622369]
131. Shah DM, Darling RC III, Chang BB, Kaufman JL, Fitzgerald KM, Leather RP. Is long vein bypass from groin to ankle a durable procedure? An analysis of a ten-year experience. *J Vasc Surg.* 1992; 15(2):402–8. [PubMed: 1735901]
132. Harrington EB, Harrington ME, Schanzer H, Jacobson JH, Haimov M. The dorsalis pedis bypass – moderate success in difficult situations. *J Vasc Surg.* 1992; 15(2):409–414. [PubMed: 1735902]
133. Quinones-Baldrich WJ, Colburn MD, Ahn SS, Gelabert HA, Moore WS. Very distal bypass for salvage of the severely ischemic extremity. *Am J Surg.* 1993; 166(2):117–23. [PubMed: 8352401]
134. Wölfle KD, Bruijnen H, Reeps C, Reutemann S, Wack C, Campbell P, Loeprecht H, Hauser H, Bohndorf K. Tibioperoneal arterial lesions and critical foot ischemia: successful management by the use of short vein grafts and percutaneous transluminal angioplasty. *Vasa.* 2000; 29(3):207–14. [PubMed: 11037720]
135. Burger DHC, Kappetein AP, van Bockel JH, Breslau PJ. A prospective randomized trial comparing vein with polytetrafluoroethylene in above-knee femoropopliteal bypass grafting. *J Vasc Surg.* 2000; 32:278–83. [PubMed: 10917987]
136. Leseche G, Ohan J, Bouttier S, Palombi T, Bertrand P, Andreassian B. Above-knee femoropopliteal bypass grafting using endothelial cell seeded PTFE grafts: five-year clinical experience. *Ann Vasc Surg.* 1995; 9 (Suppl):S15–23. [PubMed: 8688305]
137. Deutsch M, Meinhart J, Fischlein T, Preiss P, Zilla P. Clinical autologous in vitro endothelialization of infrainguinal ePTFE grafts in 100 patients: a 9-year experience. *Surgery.* 1999; 126(5):847–55. [PubMed: 10568184]

Table 1

Femoropopliteal bypass, aggregate data *

	1 month	6 months	1 year	3 years	5 years	10+ years	References
Autologous Saphenous Vein							
Primary patency	95	90	86	77	72	51	2-34
Secondary patency	96	92	92	86	83	63	2,4-6,11,13,18-20,22-5,29-31,33
Polytetrafluoroethylene							
Primary patency	93	83	77	55	51	32	3,5,12-3,15-8,21-3,25-8,30,33-61,136-7
Secondary patency	90	79	79	59	62	24	5,13,18,22-3,25,30,33,36-9,42,44-8,50,52,55,57-62
Dacron							
Primary patency	100	78	71	56	59	41	14,36,38,44,46,50,57-8,61
Secondary patency		75	74	64	70	0	36,38,44,46,50,57-8,61-2
Polyester							
Primary patency	98	84	77				20
Secondary patency	98	87	81				20
Human Umbilical Vein							
Primary patency	91	82	75	65	60		16,27,42,60,63-8
Secondary patency	90	85	76	67	70		42,60,63,65-8
Allograft vein							
Primary patency	87	84	69	59	64		69-71
Secondary patency			74	52	41		72-3
Arm vein							
Secondary patency					70		74
Limb Salvage							
Autologous saphenous v.	98	90	93	87	89	89	2-7,12-3,15,19,22,24-30,34
Polytetrafluoroethylene	92	84	88	82	71	68	3,5,12-3,15,22,25-8,30,34,36-7,40-1,45,47,49,51-3,55-6,58-60,62
Dacron			96	91	87		36,58,62
Human umbilical vein			90	83	82		27,60,63,65,67-8
Allograft vein				88			71
Arm vein					81		74
Survival							
Autologous saphenous v.			86	72	65	32	2,7,8,13,15,18,22,24-5,30-1,33

	1 month	6 months	1 year	3 years	5 years	10+ years	References
Polytetrafluoroethylene			87	77	61	33	5,13,15,18,22,25,30,33,35,37-8,40,45,50,52-3,56,58-9,62
Dacron			85	75	68	40	14,38,50,58,62
Human umbilical vein					53	3	67
Allograft vein			91	63			71

* All data is expressed as percentages

Table 1a

Supragenicular femoropopliteal bypass*

	1 month	6 months	1 year	3 years	5 years	10+ years	References
Autologous saphenous vein							
Primary patency	96	89	86	79	75	44	3,12-30
Secondary patency	96	90	89	83	80	46	13,18-20,22-25,29-30
Polytetrafluoroethylene							
Primary patency	96	87	80	58	53	32	3,12-3,15-8,21-3,25-8,30,33,35-56,136-7
Secondary patency	97	91	87	65	70	24	13,18,22-3,25,30,33,37-9,42,44-8,50,52,55,62
Dacron							
Primary patency	100	91	79	67	62	44	14,36,38,44,46,50
Secondary patency			88	75	75	0	38,44,46,50,62
Polyester							
Primary patency	98	84	77				20
Secondary patency	98	87	81				20
Human Umbilical vein							
Primary patency	91	82	79	70	60		16,27,42,63-4
Secondary patency					68		42,63
Allograft vein							
Primary patency		95	82	76	75		69
Limb Salvage							
Autologous saphenous v.	94	85	82	80	81	79	12-3,15,22,24-6,28,30
Polytetrafluoroethylene	94	85	86	79	72	68	3,12-3,15,22,25-6,28,30,40-1,45,49,51-3,55,62
Dacron				94			62
Survival							
Autologous saphenous v.				78	62	32	13,15,18,22,24-5,30
Polytetrafluoroethylene			86	81	70	33	13,15,18,22,25,30,33,35,38,40,45,50,52,62
Dacron			87	77	77	41	14,38,50,62

* All data is expressed as percentages

Table 1b

Infraginate femoropopliteal bypass*

	1 month	6 months	1 year	3 years	5 years	10+ years	References
Autologous saphenous vein							
Primary patency	93	94	86	83	71	53	3,14-5,19,21,25,27,29,31-4
Secondary patency	95		92	87	83	71	19,25,29,31,33
Polytetrafluoroethylene							
Primary patency	78	63	74	53	44	39	3,15,25,27,33-4,36-7,43,47-9,51-3,55-6,137
Secondary patency	75	58	69	48	46		25,33,37,47-8,52,55
Dacron							
Primary patency			74	46	51	26	14,36
Human Umbilical vein							
Primary patency			38	29	55		27,63,65-6
Secondary patency	90	85	65	55	62		63,65-6
Allograft vein							
Primary patency	87	74	68	55	44		69-70
Secondary patency			82	58	47		73
Limb Salvage							
Autologous saphenous v.							15,25
Polytetrafluoroethylene	87	74	74	71	63		15,25,49,51-3,55
Human umbilical vein							65
Survival							
Autologous saphenous v.				68	74		15,25,31,33
Polytetrafluoroethylene					42		15,25,33,52
Dacron			86		60	36	14

* All data is expressed as percentages

Table II

Femorotibial/femorocrural bypass*

	1 month	6 months	1 year	3 years	5 years	10 years	References
Autologous saphenous vein							
Primary patency	93	85	82	72	69	48	4,6,11,15,19,27,29,31,75-91
<i>Femoral inflow only</i>	97	85	78	74	64		4,6,11,15,27,29,31,75-79
<i>Popliteal inflow only</i>	96	88	87	77	70		75,80-85
<i>Tibial inflow only</i>	85	77	77	66	63		86-7
Secondary patency	95	88	88	79	79	60	4,6,11,19,29,31,75-84,87,89-92
<i>Femoral inflow only</i>	96	86	88	78	80	62	4,6,11,19,29,31,75-9,92
<i>Popliteal inflow only</i>	98	93	92	88	79	37	75,80-4
<i>Tibial inflow only</i>				85			87
Polytetrafluoroethylene							
Primary patency	88	70	60	40	24		15,27,37,47-8,52-3,85,93-111
<i>With distal adjunct</i>	91	74	61	47	24		85,93-100,102-5,110
<i>Without distal adjunct</i>	86	63	57	32	25		15,37,52-3,101,106-9,111
Secondary patency	90	76	65	47	28		37,47-8,52,92,94-5,97-102,106-111
<i>With distal adjunct</i>	91	78	69	60			94-5,97-100,102,110
<i>Without distal adjunct</i>	90	74	62	44	32		37,52,101,106-9,111
Human Umbilical Vein							
Primary patency	59	55	56	47	39		27,63,65-6,68,112-5
Secondary patency	71	82	66	58	47		63,65-6,68,112-4
Cryopreserved allograft vein							
Primary patency	77	65	43	40	44		69-71,116-121
Secondary patency	85	56	45	40	22		70,72-3,116,119,122-3
Arm vein							
Primary patency	87	68	61	42			90,109,124-8
Secondary patency	95	85	73	60	52		74,90,109,124-6,128
Limb salvage							
Autologous saphenous v.	97	92	94	87	89	85	4,6,15,19,29,75-7,79-84,86,88-92
Polytetrafluoroethylene	90	80	75	69	57		15,37,47,52-3,93-104,106-111
Human umbilical vein	67	63	65	61	68		63,65,68,112-5

	1 month	6 months	1 year	3 years	5 years	10 years	References
Allograft vein	93	88	74	51			70-1,116-9,121-3
Arm vein	94	82	78	84	63		74,90,109,124-7
<i>Survival</i>							
Autologous saphenous v.	96	94	85	69	60	33	15,19,31,75-8,80,83-4,86,88-90,92
Polytetrafluoroethylene	96	83	74	55	40		15,37,52,95-6,98,100-2,104-5,107-8,110-1
Human umbilical vein	87	79	79	64	50		112,115
Allograft vein		74	83	71	60		70-1,119,122-3
Arm vein	86	95	81	61			90,125-6

* All data is expressed as percentages

Table III

Bypass to pedal / ankle target*

	1 month	6 months	1 year	3 years	5 years	7 years	References
Autologous saphenous vein							
Primary patency	93	83	74	64	59	46	19,77,88,129-34
Secondary patency	97		81	82	70	49	19,77,130-4
Arm vein							
Secondary patency					55		29
Foot salvage							
Autologous saphenous	96	91	79	81	84	63	77,88,129-134
Arm vein					57		29
Survival							
Autogenous vein	98	90	89	65	63		77,88,130

* All data is expressed as percentages

Table IV

Perioperative mortality associated with infrainguinal bypass, by level

Distal anastomosis	Perioperative (30 day) mortality (%)	References
Popliteal artery	2.17	2,5,8–9,14–8,20–4,29–30,33–5,37–42,45,50–3,55–9,62–3,67,69,71–2
above-knee	0.9	16–8,20,22–4,30,35,38–42,45,50,62
Tibial/crural arteries	3.53	15,37,63,69–73,75–83,86,88–9,91–2,95–104,106–113,115–9,121–5,128
femoral inflow	4.03	15,37,63,69–73,76–9,95–104,106–113,115–9,121–4,128
popliteal inflow	1.74	80–2
tibial inflow	2	86
Distal ankle/pedal arteries	3.01	77,88,130–133