BÖLÜM 8.1

ARTERİYEL VASKÜLER YARALAR

Ahmet Serdar KARACA [1]
İsmail TIRNOVA [2]

EPİDEMİYOLOJİ VE RİSK FAKTÖRLERİ

Arteriyel vasküler yaralar sıklıkla yaşlı hasta grubunda görülmektedir. Sıklıkla 50 yaşın üzerinde görülmekle birlikte anlamlı artış 65 yaşın üzerinde olur ve 80 yaşından sonra görülme oranı en yüksek düzeyine çıkar. (1). Sigara kullanımı tüm arteriyel sistemlerde yarattığı tahribatla darlık gelişimi açısından risk faktörü olmakla birlikte alt ekstremite yaralarını %44 oranında artırabileceği bildirilmiştir (2). Sigaranın arteriyel sistem üzerindeki olumsuz etkisinin bırakılsa dahi 10 yıl sürdüğüne dair bulgular mevcuttur (2). Hipertansiyonun alt ekstremite arteriyel vasküler hastalık gelişiminde 1,3-2,2 kat artışa neden olduğu bilinmektedir (3-4). Öte yandan 92.728 bireyin incelendiği bir çalışmada hipertansiyon tüm arteriyel sistem hastalıkları için en güçlü predispozan tablo olarak saptanmıştır (5). Dislipidemi; yüksek LDL, düşük HDL kolesterol düzeyleri ve Lipoprotein a, arteriyel sistem hastalıkları için predispozan faktör olarak dikkati çekmektedir (6-7). Diyabet varlığı da kardiyovasküler hastalıklar için risk faktörü olan diğer durumlarda olduğu gibi arteriyel yaraların görülme sıklığını artırır (3). Sol ventrikül fonksiyonları da vasküler arteriyel yaralar için etken faktörlerden birisidir. Arteriyel vasküler yarası olanlarda, sol ventrikül bozukluğu görülme ihtimali iki kat artmıştır (8).

ARTERİYEL İSKEMİ PATOFİZYOLOJİSİ

İskemik süreçler bir arterin parsiyel ya da total tıkanıklığı sonucunda oluşur. Bu durum akut geliştiği zaman senaryo farklı seyrederken vasküler yaraların meydana gelebilmesi için hastalığın kronik bir sürecin sonunda ortaya çıktığı kabul edilir. Yara iyileşmesini olumsuz etkileyen en önemli faktörler arasında periferik arter hastalıkları ve diyabet gibi nedenlerle dokuya arteriyel kan ve oksijen sunumunun yetersiz kalması ve uzun süreçte düzeltilmemiş olması vardır. Arteriyel ülserlerin nedenleri Tablo 1'de gösterilmiştir.

Arteriyel akımın bozulmasına yol açan bir veya birden fazla darlık (ateroskleroz veya vaskülitik tutulum) dokulara istirahat halinde ve/veya egzersiz sırasında artan ihtiyacı karşılamak için gerekli olan oksijen sunumunun bozulmasına yol açar (Şekil-1).

[1] Prof. Dr., Başkent Üniversitesi Tıp Fakültesi Genel Cerrahi AD., karacaahmetserdar@gmail.com
[2] Uzm. Dr., Başkent Üniversitesi Tıp Fakültesi Genel Cerrahi AD., tirnova77@gmail.com

KAYNAKLAR

1. Aboyans V, Ricco JB, Bartelink MEL, et al. ESC Scientific Document Group. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteriesEndorsed by: the European Stroke Organization (ESO)The Task Force for the Diagnosis and Treatment of Peripheral Arterial Diseases of the European Society of Cardiology (ESC) and of the European Society for Vascular Surgery (ESVS). Eur Heart J. 2018 Mar 1;39(9):763-816. doi: 10.1093/eurheartj/ehx095. PMID: 28886620.
2. Graham I, Atar D, Borch-Johnsen K, et al. European Society of Cardiology (ESC) Committee for Practice Guidelines (CPG). European guidelines on cardiovascular disease prevention in clinical practice: executive summary: Fourth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (Constituted by representatives of nine societies and by invited experts). Eur Heart J. 2007 Oct;28(19):2375-414. doi: 10.1093/eurheartj/ehm316. Epub 2007 Aug 28. PMID: 17726041.
3. Pickett CA, Jackson JL, Hemann BA, et al. Carotid bruits as a prognostic indicator of cardiovascular death and myocardial infarction: a meta-analysis. Lancet. 2008 May 10;371(9624):1587-94. doi: 10.1016/S0140- 6736(08)60691-1. PMID: 18468542.
4. Morris PB, Ference BA, Jahangir E, et al. Cardiovascular Effects of Exposure to Cigarette Smoke and Electronic Cigarettes: Clinical Perspectives From the Prevention of Cardiovascular Disease Section Leadership Council and Early Career Councils of the American College of Cardiology. J Am Coll Cardiol. 2015 Sep 22;66(12):1378-91. doi: 10.1016/j.jacc.2015.07.037. PMID: 26383726.
5. Antoniou GA, Fisher RK, Georgiadis GS, et al. Statin therapy in lower limb peripheral arterial disease: Systematic review and meta-analysis. Vascul Pharmacol. 2014 Nov;63(2):79-87. doi: 10.1016/j.vph.2014.09.001. Epub 2014 Oct 18. PMID: 25446168.
6. Ramalho J, Semelka RC, Ramalho M,et al. Gadolinium-Based Contrast Agent Accumulation and Toxicity: An Update. AJNR Am J Neuroradiol. 2016 Jul;37(7):1192-8. doi: 10.3174/ajnr.A4615. Epub 2015 Dec 10. PMID: 26659341; PMCID: PMC7960350.
7. Huang Y, Li W, Dong L, et al. Effect of statin therapy on the progression of common carotid artery intima-media thickness: an updated systematic review and meta-analysis of randomized controlled trials. J Atheroscler Thromb. 2013;20(1):108-21. doi: 10.5551/jat.14001. Epub 2012 Oct 25. PMID: 23095240.
8. Arthurs ZM, Titus J, Bannazadeh M, et al. A comparison of endovascular revascularization with traditional therapy for the treatment of acute mesenteric ischemia. J Vasc Surg. 2011 Mar;53(3):698-704; discussion 704-5. doi: 10.1016/j.jvs.2010.09.049. Epub 2011 Jan 14. PMID: 21236616.
9. Signorelli SS, Vanella L, Abraham NG, et al. Pathophysiology of chronic peripheral ischemia: new perspectives. Ther Adv Chronic Dis. 2020 Feb 5;11:2040622319894466. doi: 10.1177/2040622319894466. PMID: 32076496; PMCID: PMC7003198.
10. Hart CR, Layec G, Trinity JD, et al. Increased skeletal muscle mitochondrial free radical production in peripheral arterial disease despite preserved mitochondrial respiratory capacity. Exp Physiol. 2018 Jun;103(6):838-850. doi: 10.1113/EP086905. Epub 2018 May 8. PMID: 29604234; PMCID: PMC7640985.
11. Pipinos II, Judge AR, Zhu Z, et al. Mitochondrial defects and oxidative damage in patients with peripheral arterial disease. Free Radic Biol Med. 2006 Jul 15;41(2):262-9. doi: 10.1016/j.freeradbiomed.2006.04.003. Epub 2006 Apr 22. PMID: 16814106.
12. Pipinos II, Sharov VG, Shepard AD, et al. Abnormal mitochondrial respiration in skeletal muscle in patients with peripheral arterial disease. J Vasc Surg. 2003 Oct;38(4):827-32. doi: 10.1016/s0741-5214(03)00602-5. PMID: 14560237.
13. Andreozzi GM, Riggio F, Buttò G, et al. Transcutaneous PCO2 level as an index of tissue resistance to ischemia. Angiology. 1995 Dec;46(12):1097-102. doi: 10.1177/000331979504601204. PMID: 7495314.
14. Comerota AJ, Throm RC, Kelly P, et al. Tissue (muscle) oxygen saturation (StO2): a new measure of symptomatic lower-extremity arterial disease. J Vasc Surg. 2003 Oct;38(4):724-9. doi: 10.1016/s0741-5214(03)01032-2. PMID: 14560221.
15. Bauer TA, Brass EP, Hiatt WR. Impaired muscle oxygen use at onset of exercise in peripheral arterial disease. J Vasc Surg. 2004 Sep;40(3):488-93. doi: 10.1016/j.jvs.2004.06.025. PMID: 15337878.
16. Signorelli SS, Malaponte G, Libra M, et al. Plasma levels and zymographic activities of matrix metalloproteinases 2 and 9 in type II diabetics with peripheral arterial disease. Vasc Med. 2005 Feb;10(1):1-6. doi: 10.1191/1358863x05vm582oa. PMID: 15920993.
17. Signorelli SS, Malaponte G, Di Pino L, et al. Effects of ischaemic stress on leukocyte activation processes in patients with chronic peripheral occlusive arterial disease: role of L-propionyl carnitine administration. Pharmacol Res. 2001 Oct;44(4):305-9. doi: 10.1006/phrs.2001.0863. PMID: 11592865.
18. Brevetti G, Angelini C, Rosa M, et al. Muscle carnitine deficiency in patients with severe peripheral vascular disease. Circulation. 1991 Oct;84(4):1490-5. doi: 10.1161/01.cir.84.4.1490. PMID: 1914091.
19. Armstrong EJ. Advances in the Treatment of Chronic Limb-Threatening Ischemia. J Endovasc Ther. 2020 Aug;27(4):521-523. doi: 10.1177/1526602820942857. PMID: 32900276.
20. Alahdab F, Wang AT, Elraiyah TA, et al. A systematic

review for the screening for peripheral arterial disease in asymptomatic patients. J Vasc Surg. 2015 Mar;61(3 Suppl):42S-53S. doi: 10.1016/j.jvs.2014.12.008. Epub 2015 Feb 23. PMID: 25721066.
21. Arnold JF. Vascular Assessment of the Lower Extremity with a Chronic Wound. Surg Clin North Am. 2020 Aug;100(4):807-822. doi: 10.1016/j.suc.2020.05.008. Epub 2020 Jun 17. PMID: 32681878.
22. Aubert CE, Cluzel P, Kemel S, Michel PL, Lajat-Kiss F, Dadon M, Hartemann A, Bourron O. Influence of peripheral vascular calcification on efficiency of screening tests for peripheral arterial occlusive disease in diabetes--a cross-sectional study. Diabet Med. 2014 Feb;31(2):192-9. doi: 10.1111/dme.12309. Epub 2013 Sep 11. PMID: 23952656.
23. Sibona A, Bianchi C, Leong B, et al. A single center's 15-year experience with palliative limb care for chronic limb threatening ischemia in frail patients. J Vasc Surg. 2022 Mar;75(3):1014-1020.e1. doi: 10.1016/j.jvs.2021.09.032. Epub 2021 Oct 8. PMID: 34627958.
24. Foley TR, Armstrong EJ, Waldo SW. Contemporary evaluation and management of lower extremity peripheral artery disease. Heart. 2016 Sep 15;102(18):1436-41. doi: 10.1136/heartjnl-2015-309076. Epub 2016 Jun 1. PMID: 27250215.
25. Firnhaber JM, Powell CS. Lower Extremity Peripheral Artery Disease: Diagnosis and Treatment. Am Fam Physician. 2019 Mar 15;99(6):362-369. Erratum in: Am Fam Physician. 2019 Jul 15;100(2):74. PMID: 30874413.
26. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC Guideline on the Management of Patients With Lower Extremity Peripheral Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2017 Mar 21;135(12):e726-e779. doi: 10.1161/CIR.0000000000000471. Epub 2016 Nov 13. Erratum in: Circulation. 2017 Mar 21;135(12):e791-e792. PMID: 27840333; PMCID: PMC5477786.
27. Aguirre A, Sharma K, Arora A, et al. Early ABI Testing May Decrease Risk of Amputation for Patients With Lower Extremity Ulcers. Ann Vasc Surg. 2022 Feb;79:65-71. doi: 10.1016/j.avsg.2021.08.015. Epub 2021 Oct 14. PMID: 34656726.
28. Stein R, Hriljac I, Halperin JL, et al. Limitation of the resting ankle-brachial index in symptomatic patients with peripheral arterial disease. Vasc Med. 2006 Feb;11(1):29-33. doi: 10.1191/1358863x06vm663oa. PMID: 16669410.
29. Giugliano G, Laurenzano E, Rengo C, et al. Abdominal aortic aneurysm in patients affected by intermittent claudication: prevalence and clinical predictors. BMC Surg. 2012;12 Suppl 1(Suppl 1):S17. doi: 10.1186/1471- 2482-12-S1-S17. Epub 2012 Nov 15. PMID: 23173942; PMCID: PMC3499243.
30. Mills JL Sr, Conte MS, Armstrong DG, Pomposelli FB, Schanzer A, Sidawy AN, Andros G; Society for Vascular Surgery Lower Extremity Guidelines Committee. The Society for Vascular Surgery Lower Extremity Threatened Limb Classification System: risk stratification based on wound, ischemia, and foot infection (WIfI). J Vasc Surg. 2014 Jan;59(1):220-34. e1-2. doi: 10.1016/j.jvs.2013.08.003. Epub 2013 Oct 12. PMID: 24126108.
31. Linger RJ, Belikoff EJ, Yan Y, et al. Towards next generation maggot debridement therapy: transgenic Lucilia sericata larvae that produce and secrete a human growth factor. BMC Biotechnol. 2016;16:30.)
32. Canadian Agency for Drugs and Technologies in Health. Debridement Procedures for Managing Diabetic Foot Ulcers: A Review of Clinical Effectiveness, Costeffectiveness, and Guidelines. Canadian Agency for Drugs and Technologies in Health; 2014. Accessed April 24, 2020. https://www.ncbi.nlm.nih.gov/books/NBK253769/)
33. Eleftheriadou I, Samakidou G, Tentolouris A, et al. Nonpharmacological Management of Diabetic Foot Ulcers: An Update. Int J Low Extrem Wounds. 2021 Sep;20(3):188-197. doi: 10.1177/1534734620963561. Epub 2020 Oct 19. PMID: 33073653).
34. Broderick C, Pagnamenta F, Forster R. Dressings and topical agents for arterial leg ulcers. Cochrane Database Syst Rev. 2020 Jan 20;1(1):CD001836. doi: 10.1002/14651858.CD001836.pub4. PMID: 31978262; PMCID: PMC6984409.
35. Ho VT, Gologorsky R, Kibrik P, et al. Open, percutaneous, and hybrid deep venous arterialization technique for no-option foot salvage. J Vasc Surg. 2020 Jun;71(6):2152-2160. doi: 10.1016/j.jvs.2019.10.085. Epub 2019 Dec 31. PMID: 31901360.
36. Fowkes FG, Price JF, Stewart MC, Butcher I, Leng GC, Pell AC, Sandercock PA, Fox KA, Lowe GD, Murray GD; Aspirin for Asymptomatic Atherosclerosis Trialists. Aspirin for prevention of cardiovascular events in a general population screened for a low ankle brachial index: a randomized controlled trial. JAMA. 2010 Mar 3;303(9):841- 8. doi: 10.1001/jama.2010.221. PMID: 20197530.
37. Anand SS, Bosch J, Eikelboom JW, et al. Rivaroxaban with or without aspirin in patients with stable peripheral or carotid artery disease: an international, randomised, double-blind, placebo-controlled trial. Lancet. 2018 Jan 20;391(10117):219-229. doi: 10.1016/S0140-6736(17)32409-1. Epub 2017 Nov 10. PMID: 29132880.
38. Kumbhani DJ, Steg PG, Cannon CP, Eagle KA, Smith SC Jr, Goto S, Ohman EM, Elbez Y, Sritara P, Baumgartner I, Banerjee S, Creager MA, Bhatt DL; REACH Registry Investigators. Statin therapy and long-term adverse limb outcomes in patients with peripheral artery disease: insights from the REACH registry. Eur Heart J. 2014 Nov 1;35(41):2864-72. doi: 10.1093/eurheartj/ehu080. Epub 2014 Feb 28. PMID: 24585266; PMCID: PMC4216432.
39. Mohler ER 3rd, Hiatt WR, Creager MA. Cholesterol reduction with atorvastatin improves walking distance in patients with peripheral arterial disease. Circu-

lation. 2003 Sep 23;108(12):1481-6. doi: 10.1161/01.CIR.0000090686.57897.F5. Epub 2003 Sep 2. PMID: 12952839.

40. Sun H, Pulakat L, Anderson DW. Challenges and New Therapeutic Approaches in the Management of Chronic Wounds. Curr Drug Targets. 2020;21(12):1264-1275. doi: 10.2174/1389450121666200623131200. PMID: 32576127.
41. Conte MS, Bradbury AW, Kolh P, White JV, Dick F, Fitridge R, Mills JL, Ricco JB, Suresh KR, Murad MH; GVG Writing Group. Global vascular guidelines on the management of chronic limb-threatening ischemia. J Vasc Surg. 2019 Jun;69(6S):3S-125S.e40. doi: 10.1016/j.jvs.2019.02.016. Epub 2019 May 28. Erratum in: J Vasc Surg. 2019 Aug;70(2):662. PMID: 31159978; PMCID: PMC8365864.
42. Paraskevas KI, Geroulakos G. Repeat Endovascular Intervention Versus Lower Extremity Bypass for Failed Previous Endovascular Intervention. Angiology. 2019 Jul;70(6):477-478. doi: 10.1177/0003319718822899. Epub 2019 Jan 7. PMID: 30616375.
43. Krzanowski M, Partyka L. Regarding "Lower extremity bypass for critical limb ischemia decreases major adverse limb events with equivalent cardiac risk compared with endovascular intervention". J Vasc Surg. 2018 May;67(5):1637. doi: 10.1016/j.jvs.2017.12.024. PMID: 29685259.
44. Kersting J, Kamper L, Das M et al. Guideline-Oriented Therapy of Lower Extremity Peripheral Artery Disease (PAD) - Current Data and Perspectives. Fortschr Röntgenstr 2019; 191: 311 - 322.
45. Malgor RD, Ricotta JJ 2nd, Bower TC, et al. Common femoral artery endarterectomy for lower-extremity ischemia: evaluating the need for additional distal limb revascularization. Ann Vasc Surg. 2012 Oct;26(7):946- 56. doi: 10.1016/j.avsg.2012.02.014. PMID: 22944568.
46. Piazza M, Ricotta JJ 2nd, Bower TC, et al. Iliac artery stenting combined with open femoral endarterectomy is as effective as open surgical reconstruction for severe iliac and common femoral occlusive disease. J Vasc Surg. 2011 Aug;54(2):402-11. doi: 10.1016/j.jvs.2011.01.027. Epub 2011 Apr 30. PMID: 21531527.
47. Domínguez LJG, Moreno IR, Núñez LG, et al. Hybrid revascularization of chronic limb-threatening ischemia using popliteal below-knee and tibial trifurcation open endarterectomy distally plus inter-woven nitinol stenting proximally. Ann Vasc Surg. 2022 Mar;80:386-391. doi: 10.1016/j.avsg.2021.10.056. Epub 2021 Nov 23. PMID: 34826576.
48. Teot L, Ohura N. Challenges and Management in Wound Care. Plast Reconstr Surg. 2021 Jan 1;147(1S-1):9S- 15S. doi: 10.1097/PRS.0000000000007628. PMID: 33347058.
49. Anghel EL, Kim PJ, Attinger CE. A solution for complex wounds: the evidence for negative pressure wound therapy with instillation. Int Wound J. 2016 Sep;13 Suppl 3(Suppl 3):19-24. doi: 10.1111/iwj.12664. PMID: 27547960; PMCID: PMC7950003.