

Bölüm 22

DİYABETİK AYAK HASTASINDA YAKLAŞIM ve YÖNETİM

Levent DEMİR¹

GİRİŞ

Diyabetis mellitus dünya genelinde 425 milyon insanda olduğu tahmin edilen 21. yüzyılın en büyük küresel sağlık problemlerinden biridir(1). Önümüzdeki 20 yılda %55 daha fazla insanı etkileyeceği tahmin edilen bu salgının sonucu olarak diyabetin majör komplikasyonlarından biri olan diyabetik ayağın(DA) da artmaya devam etmesi beklenmektedir(2). DA yaygındır, ortalama 12 haftada iyileşir ve yüksek ekstremitte kaybı riski ile ilişkilidir(3). Diyabetli hastaların %25 inde DA geliştiği ve her 20 saniyede bir bacağın bu sebepten dolayı kaybedildiği tahmin edilmektedir(4).

DA tanısı konmuş hastaların 5 yıllık mortalite oranı %50'ye yaklaşmaktadır. Bu oran prostat kanseri, meme kanseri ve hodgkin hastalığı için olanlardan daha yüksektir(5). Alt ekstremitte amputasyonu sonrası bu hastalarda kalori ihtiyacı artar, oksijen tüketimi artar, daha fazla kardiyak rezerve ihtiyaç duyulur. Alt ekstremitte amputasyonu sonrası 30 günlük mortalite %22, 1 yıllık mortalite %44 bulunmuştur(6). 5 yıllık mortalite diz altı seviyesinde %80'e, diz üstü seviyesinde %90'a kadar yükselmekte, ek olarak diyaliz tedavisi alanlarda ise 2 yıllık mortalite %74'lere çıkmaktadır(7,8). DA hastaları ölümden daha fazla korkulan bir komplikasyon olan alt ekstremitte amputasyon ihtimali ile karşılaştıklarında, hayatlarının beklide en zor kararlarını verecekleri, en stresli dönemlerinden birini geçirirler(9).

2015 yılında diyabetin tüm dünyaya maliyeti 1,3 trilyon dolar olduğu tahmin edilmektedir. Diyabete bağlı harcamaların üçte birine kadar olan kısmını alt ekstremitte kaynaklı problemler oluşturmaktadır. Bu da bütün sağlık harcamalarının %1'ini DA kaynaklı masrafların oluşturduğu anlamına gelir. Ayrıca bu oranların gelişmekte olan ülkelerde daha yüksek olduğu düşünülmektedir(3,10).

¹ Denizli Özel Sağlık Hastanesi, Suatlı Hekimliği ve Hiperbarik Tıp, drldemir@yahoo.com

teki gibi ihmal edilmeye devam edilirse bu sorunun yükü artan diyabet salgını nedeniyle daha da çoğalacaktır. Gözlemsel araştırmalar DA'nın multidisipliner yaklaşımla yönetildiği merkezlerde, majör amputasyonların dramatik bir şekilde azaldığını göstermiştir(68). Bu hastalarda amaç tekrar yara açılmasını engellemek için ayağın korunması yanında, her rekürrens de kompike olmasını engelleyerek hastanın olabildiğince üsersiz, hastanesiz ve aktivite kısıtlılığı olmadan hayatlarına devam etmelerini sağlamak olmalıdır(69).

KAYNAKLAR

1. Ogurtsova K, da Rocha Fernandes JD, Huang Y, et al. IDF Diabetes Atlas: global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Res Clin Pract* 2017;128:40–50.
2. Lavery L A , Oz OK, Bhavan K, Wukich DK. Diabetic Foot Syndrome in the Twenty-First Century. *Clinics in Podiatric Medicine and Surgery*. 2019 Jul;36(3):355-359.
3. Jeffcoate WJ, Vileikyte L, Boyko EJ, et al. Current Challenges and Opportunities in the Prevention and Management of Diabetic Foot Ulcers. *Diabetes Care*. 2018 Apr;41(4):645-652.
4. Mairghani M, Jassim G, Elmusharaf K, et al. Methodological approaches for assessing the cost of diabetic foot ulcers: a systematic literature review. *J Wound Care*. 2019 May 2;28(5):261-266
5. Armstrong DG, Wrobel J, Robbins JM. Guest Editorial: are diabetes-related wounds and amputations worse than cancer? *Int Wound J* 2007;4: 286–287
6. Fortington LV, Geertzen JH, van Netten JJ, et al. Short and long term mortality rates after a lower limb amputation. *Eur J Vasc Endovasc Surg*. 2013;46:124–131.
7. Thorud JC, Plemmons B, Buckley CJ, et al. Mortality after nontraumatic major amputation among patients with diabetes and peripheral vascular disease: a systematic review. *J Foot Ankle Surg*. 2016;55:591–599. doi: 10.1053/j.jfas.2016.01.012.
8. Lavery LA, Hunt NA, Ndip A, Lavery DC, et al. Impact of chronic kidney disease on survival after amputation in individuals with diabetes. *Diabetes Care* 2010; 33: 2365-9.
9. Wukich DK, Raspovic KM, Suder NC. Patients With Diabetic Foot Disease Fear Major Lower-Extremity Amputation More Than Death. *Foot Ankle Spec*. 2018 Feb;11(1):17-21.
10. Bommer C, Heesemann E, Sagalova V, et al. The global economic burden of diabetes in adults aged 20–79 years: a cost-of-illness study. *The Lancet Diabetes & Endocrinology*. 2017;5(6): 23–430.
11. Prompers L, Schaper N, Apelqvist J, et al. Prediction of outcome in individuals with diabetic foot ulcers: focus on the differences between individuals with and without peripheral arterial disease: the EURODIALE Study. *Diabetologia* 2008; 51: 747-55.
12. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med* 2017;376:2367–2375.
13. Volmer-Thole M, Lobmann R. Neuropathy and Diabetic Foot Syndrome. *International Journal of Molecular Sciences*. 2016;17(6): 917.
14. Monteiro-Soares M, Boyko EJ, Ribeiro J, et al. Predictive factors for diabetic foot ulceration: a systematic review. *Diabetes Metab Res Rev*. 2012;28:574–600
15. Bus SA, Maas M, Peter R, et al. Plantar Fat-Pad Displacement in Neuropathic Diabetic Patients With Toe Deformity. *Diabetes Care*. 2004 Oct; 27 (10):2376-2381.
16. Sharma A, Fountoulakis N, Vas PR, Karalliedde J. 72-OR: Clinical Burden and Impact of New-Onset Diabetic Foot Ulcers, Post-Simultaneous Pancreas Kidney Transplantation, and Kidney Only Transplantation. *Diabetes*. 2019 jun;68(1) DOI: 10.2337/db19-72-OR
17. Mishra SC, Chhatbar KC, Kashikar A, et al. Diabetic foot. *BMJ* 2017;359:j5064.
18. Palena LM, Diaz-Sandoval LJ, Candeo A, et al. Automated carbon dioxide angiography for the evaluation and endovascular treatment of diabetic patients with critical limb ischemia. *J Endovasc Ther* 2016;23:40–48.

19. Monteiro-Soares M, Boyko EJ, Jeffcoate W, et al. Diabetic foot ulcer classifications: a critical review. *Diab Metab Res Rev*. 2019;In press.
20. Boulton AJM, Armstrong DG, Kirsner RS, et al. *Diagnosis and Management of Diabetic Foot Complications*. Arlington (VA): American Diabetes Association; 2018 Oct. doi: 10.2337/db20182-1
21. Health Quality Ontario. Fibreglass total contact casting, removable cast walkers, and irremovable cast walkers to treat diabetic neuropathic foot ulcers: a health technology assessment. *Ont Health Technol Assess Ser* 2017;17:1-124
22. Health Quality Ontario. Fibreglass Total Contact Casting, Removable Cast Walkers, and Irremovable Cast Walkers to Treat Diabetic Neuropathic Foot Ulcers: A Health Technology Assessment. *Ont Health Technol Assess Ser*. 2017;17(12):1-124.
23. Bus SA, van Deursen RW, Armstrong DG, et al; International Working Group on the Diabetic Foot. Footwear and offloading interventions to prevent and heal foot ulcers and reduce plantar pressure in patients with diabetes: a systematic review. *Diabetes Metab Res Rev*. 2016;32(1):99-118.
24. Crews RT, Candela J. Decreasing an Offloading Device's Size and Offsetting Its Imposed Limb-Length Discrepancy Lead to Improved Comfort and Gait. *Diabetes Care*. 2018 Jul; 41(7):1400-1405.
25. Lipsky BA, Aragón-Sánchez J, Diggle M, et al.; International Working Group on the Diabetic Foot. IWGDF guidance on the diagnosis and management of foot infections in persons with diabetes. *Diabetes Metab Res Rev* 2016;32(Suppl. 1):45-74
26. Pereira SG, Moura J, Carvalho E, Empadinhas N. Microbiota of chronic diabetic wounds: ecology, impact, and potential for innovative treatment strategies. *Front Microbiol* 2017;8:1791
27. Saltoglu, N, Ergonul O, Tulek N, et al. Influence of multidrug resistant organisms on the outcome of diabetic foot infection. *International Journal of Infectious Diseases*. 2018;70:10-14.
28. Dumville JC, Lipsky BA, Hoey C, et al. Topical antimicrobial agents for treating foot ulcers in people with diabetes. *Cochrane Database Syst Rev* 2017;CD011038
29. Olid SA, Solà I, Barajas-Nava LA, et al. Systemic antibiotics for treating diabetic foot infections. *Cochrane Database Syst Rev* 2015;CD009061
30. Barwell ND, Devers MC, Kennon B, et al. Diabetic foot infection: Antibiotic therapy and good practice recommendations. *Int J Clin Pract* 2017;71.
31. Abbas M, Uckay I, Lipsky BA. In diabetic foot infections antibiotics are to treat infection, not to heal wounds. *Expert Opin Pharmacother* 2015;16:821-32.
32. Aktaş Ş, Ertuğrul MB. Diyabetik Ayak ve Kronik Yaralarda Biyofilm. *Türkiye Klinikleri Infectious Diseases Special Topics*. 2018;11(3):26-32.
33. Willke Topçu A. Biyofilm Nedir? Biyofilm Enfeksiyonları. *Türkiye Klinikleri Infectious Diseases Special Topics*. 2018;11(3):1-3.
34. Percival SL, Malone M, Mayer D, et al. Role of anaerobes in polymicrobial communities and biofilms complicating diabetic foot ulcers. *Int Wound J* 2018;15:776-82
35. Fisher TK, Scimeca CL, Bharara M, Mills et al. A stepwise approach for surgical management of diabetic foot infections. *J Am Podiatr Med Assoc* 2010;100:401-405
36. Grodinsky M. A study of the fascial spaces of the foot and their bearing on infections. *Surg Gynecol Obstet* 1929;49:739.
37. Loeffler RD, Ballard A. Plantar fascial spaces of the foot and a proposed surgical approach. *Foot Ankle* 1980;1:11.
38. Allahabadi S, Haroun KB, Musher DM, et al. Consensus on surgical aspects of managing osteomyelitis in the diabetic foot. *Diabetic Foot & Ankle* 2016;7:1
39. Besse JL, Leemrijse T, Deleu PA. Diabetic foot: The orthopedic surgery angle. *Orthop Traumatol Surg Res* 2011;97(3):314-29
40. Akan K. Diyabetik ayakta amputasyon. *TOTBİD Dergisi* 2015; 14:421-432
41. Hinchliffe RJ, Brownrigg JRW, Andros G, et al. Effectiveness of revascularization of the ulcerated foot in patients with diabetes and peripheral artery disease: a systematic review. *Diabetes Metab Res Rev*. 2016;32: 136- 144.

42. Causey MW, Ahmed A, Wu B, et al. Society for Vascular Surgery limb stage and patient risk correlate with outcomes in an amputation prevention program. *J Vasc Surg* 2016;63:1563–1573
43. van den Berg JC. Angiosome perfusion of the foot: An old theory or a new issue? *Seminars in Vascular Surgery*. 2018;31(2-4):56-65.
44. Bandyk DF. The diabetic foot: Pathophysiology, evaluation, and treatment. *Semin Vasc Surg*. 2018 Jun - Dec;31(2-4):43-48.
45. Saltoğlu N, Kılıçoğlu Ö, Baktıroğlu S, et al. Diyabetik ayak yarası ve enfeksiyonunun tanısı, tedavisi ve önlenmesi: ulusal uzlaşma raporu. *Klimik Dergisi* 2015;28:2-34
46. Tallis A, Motley TA, Wunderlich RP, et al. Clinical and economic assessment of diabetic foot ulcer debridement with collagenase: results of a randomized controlled study. *Clin Ther* 2013;35:1805-1820.
47. Sun X, Chen J, Zhang J, et al. Maggot debridement therapy promotes diabetic foot wound healing by up-regulating endothelial cell activity. *J Diabetes Complications* 2016;30:318-322.
48. Caputo WJ, Beggs DJ, Defede JL, et al. A prospective randomised controlled clinical trial comparing hydrosurgery debridement with conventional surgical debridement in lower extremity ulcers. *Int Wound J* 2008;5:288-294.
49. Game FL, Jeffcoate WJ. Dressing and diabetic foot ulcers: a current review of the evidence. *Plast Reconstr Surg*. 2016;138:158-164.
50. Stansal A, Tella E, Yannoutsos A, et al. Supervised short-stretch compression therapy in mixed leg ulcers. *J Med Vasc* 2018;43(4):225–30.
51. Yang SL, Zhu LY, Han R, Sun LL, Dou JT (2017) Effect of negative pressure wound therapy on cellular fibronectin and transforming growth factor- β 1 expression in diabetic foot wounds. *Foot Ankle Int* 38:893–900
52. Liu Z, Dumville JC, Hinchliffe RJ, Cullum N, Game F, Stubbs N, Sweeting M, Peinemann F. Negative pressure wound therapy for treating foot wounds in people with diabetes mellitus. *Cochrane Database of Systematic Reviews* 2018, Issue 10. Art. No.: CD010318. DOI: 10.1002/14651858.CD010318.pub3.
53. Orgill DP, Bayer LR. Negative pressure wound therapy: past, present and future. *Int Wound J*. 2013;10(1):15-19
- 54) Dhamodharan U, Karan A, Sireesh D, et al. Tissue-specific role of Nrf2 in the treatment of diabetic foot ulcers during hyperbaric oxygen therapy. *Free Radical Biology and Medicine*. 2019;138:53-62,
55. M. Cimsit, G. Uzun, S. Yildiz. Hyperbaric oxygen therapy as an anti-infective agent, *Expert Rev. Anti-infect Ther*. 2009;7(8):1015–1026
56. Sunkari VG, Lind F, Botusan IR, et al. Hyperbaric Oxygen Therapy Activates HypoxiaInducible Factor 1 (HIF-1), Which Contributes to Improved Wound Healing in Diabetic Mice. *Wound Repair Regen*. 2015;23(1):98–103
57. Game FL, Hinchliffe RJ, Apelqvist J et al. A systematic review of interventions to enhance the healing of chronic ulcers of the foot in diabetes. *Diabetes Metabol Res Rev*. 2012;28(1):119–141.
58. Stoekenbroek RM, Santema TB, Legemate DA, et al. Hyperbaric oxygen for the treatment of diabetic foot ulcers: a systematic review, *Eur. J. Vasc. Endovasc. Surg*. 2014;47(6):647–655.
59. The Long-Term Outcomes Following the Application of Intralesional Epidermal Growth Factor in Patients With Diabetic Foot Ulcers Kahraman M, Misir A, Kızkapan TB, et al. *J Foot Ankle Surg*. 2019;58(2):282 - 287
60. Ertugrul BM, Lipsky BA, Guvenc U; Turkish Intralesional Epidermal Growth Factor Study Group for Diabetic Foot Wounds. An Assessment of Intralesional Epidermal Growth Factor for Treating Diabetic Foot Wounds. *J Am Podiatr Assoc*. 2017 Jan;107(1):17-29
61. Aktaş Ş, Baktıroğlu S, Demir L, Kılıçoğlu Ö, Topalan M, Güven E, Mirasoğlu B, Yanar F. Intralesional application of epidermal growth factor in limb-threatening ischemic diabetic foot ulcers. *Acta Orthop Traumatol Turc*. 2016;50:277–283
62. Jeffcoate WJ. Charcot foot syndrome. *Diabet Med*. 2015;32:760–770
63. Kılıçoğlu Ö, Demirel M, Aktaş S. New trends in the orthopaedic management of diabetic foot. *Efort Open Reviews*. 2018;3(5)269-277.

64. Waaijman R, de Haart M, Arts MLJ, et al. Risk Factors for Plantar Foot Ulcer Recurrence in Neuropathic Diabetic Patients. *Diabetes Care*. 2014;37(6):1697–1705.
65. Lavery la, La Fontaine J, Kim PJ. Preventing the first or recurrent ulcers. *Med Clin North Am* 2013;97:807-820
66. Lincoln NB, Radford KA, et al. Education for secondary prevention of foot ulcers in people with diabetes: a randomised controlled trial. *Diabetologia*. 2008;51:1954-61
67. Basatneh R, Najafi B, Armstrong DG. Health sensors, smart home devices, and the Internet of Medical Things: an opportunity for dramatic improvement in care for the lower extremity complications of diabetes. *J Diabetes Sci Technol* 2018;12:577–586
68. Jeffcoate W, Barron E, Lomas J, et al. Using data to tackle the burden of amputation in diabetes. *Lancet* 2017;390:29–30
69. Boghossian J, Miller J, Armstrong D. Offloading the diabetic foot: toward healing wounds and extending ulcer-free days in remission. *Chronic Wound Care Management and Research* 2017;4:83–88