

Bölüm

7

Hipertansiyon, İmmunite ve İnflamasyon

Emine YAĞCI¹

Cansu ÖZBAYER²

Hülyam KURT³

GİRİŞ

Hipertansiyon en yaygın kronik hastalıklardan biri olmakla birlikte kalp yetmezliği, felç, kronik böbrek hastalığı ve ölümlerin başlıca nedenidir. Diğer hastalıklar ile benzer şekilde, idiyopatik hipertansiyon, kesin nedeni ve patofizyolojisi bilinmediğinde temel (esansiyel) veya birincil (primer) olarak adlandırılır. Hipertansiyonun bilinen, doğrudan nedenleri tüm vakaların yalnızca % 5-10'unda tespit edilebilir ve altta yatan kesin bir patofizyolojik mekanizma nedeniyle “ikincil” olarak adlandırılır⁽¹⁾.

Esansiyel hipertansiyon, kan akışına karşı artmış periferik vasküler direnç ile karakterizedir. Endotel, vasküler tonusun çok önemli bir düzenleyicisidir. Hipertansiyonlu hastalarda endotel fonksiyonu bozulmuştur, buna azalmış vazodilataşyon, proinflamatuar ve protrombotik durumla ilişkili olarak artmış vasküler ton eşlik eder. Bu nedenle, vasküler dokuda lokalize olan düşük dereceli inflamasyon, hipertansiyonun patofizyolojisine, aterosklerozun başlamasına ve ilerlemesine ve ayrıca kardiyovasküler hastalıkların gelişimi için önemli bir risk olarak kabul edilmektedir^(2, 3).

Düşük dereceli inflamasyonun, kan basıncı yükselmesinin başlatılmasında ve sürdürülmesinde önemli bir aracı olduğu ve kronik inflamatuar hastalıklarla bağlantılı olarak kan basıncı yükselmesini tetikleyebilecegi bildirilmektedir. Adezyon molekülleri ve kemokin ekspresyonu,immün hücre aktivasyonu ve infiltrasyonu, sitokin salınımı ve oksidatif stres gibi tüm inflamatuar mekanizmalar hipertansiyonda artar⁽⁴⁾.

Bağışıklık sistemi, inflamasyon ve hipertansiyon birbiriley ilişkilidir. Doğuştan gelen ve kazanılmış bağışıklık sistemi, kan basıncını yükseltebilir ve organ hasa-

¹ Arş. Gör., Eskişehir Osmangazi Üniversitesi, eminetisci@gmail.com

² Doç.Dr., Kütahya Sağlık Bilimleri Üniversitesi, cansu.ozbayer@ksbu.edu.tr

³ Prof. Dr., Eskişehir Osmangazi Üniversitesi, hkurtayda@gmail.com

KAYNAKÇA

1. Solak Y, Afsar B, Vaziri ND, et al. Hypertension as an autoimmune and inflammatory disease. *Hypertension Research*, 2016; 39(8):567-573.
2. Savoia C, Sada L, Zezza L, et al. Vascular inflammation and endothelial dysfunction in experimental hypertension. *International journal of hypertension*, 2011; 2011.
3. Savoia C, Schiffrin EL. Inflammation in hypertension. *Current opinion in nephrology and hypertension*, 2006; 15(2):152-158.
4. Caillon A, Schiffrin EL. Role of inflammation and immunity in hypertension: recent epidemiological, laboratory, and clinical evidence. *Current hypertension reports*, 2016; 18(3):21.
5. Agita A, Alsagaff MT. Inflammation, immunity, and hypertension. *Acta Med Indones*, 2017; 49(2):158-165.
6. Newton K, Dixit VM. Signaling in innate immunity and inflammation. *Cold Spring Harbor perspectives in biology*, 2012; 4(3):a006049.
7. Kominsky DJ, Campbell EL, Colgan SP. Metabolic shifts in immunity and inflammation. *The Journal of Immunology*, 2010; 184(8):4062-4068.
8. McMaster WG, Kirabo A, Madhur MS, et al. Inflammation, immunity, and hypertensive end-organ damage. *Circulation research*, 2015; 116(6):1022-1033.
9. Harrison DG, Guzik TJ, Lob HE, et al. Inflammation, immunity, and hypertension. *Hypertension*, 2011; 57(2):132-140.
10. Lilly LS, Braunwald E. (2012). *Braunwald's heart disease: a textbook of cardiovascular medicine* (Cev. Ed. Vol. 2): Elsevier Health Sciences.
11. Ryan MJ. An update on immune system activation in the pathogenesis of hypertension. *Hypertension*, 2013; 62(2):226-230.
12. Cowley Jr AW. Renal medullary oxidative stress, pressure-natriuresis, and hypertension. *Hypertension*, 2008; 52(5):777-786.
13. Wadley AJ, van Zanten JJV, Aldred S. The interactions of oxidative stress and inflammation with vascular dysfunction in ageing: the vascular health triad. *Age*, 2013; 35(3):705-718.
14. De Miguel C, Rudemiller NP, Abais JM, et al. Inflammation and hypertension: new understandings and potential therapeutic targets. *Current hypertension reports*, 2015; 17(1):507.
15. Ramseyer VD, Garvin JL. Tumor necrosis factor- α : regulation of renal function and blood pressure. *American Journal of Physiology-Renal Physiology*, 2013; 304(10):F1231-F1242.
16. Onishi RM, Gaffen SL. Interleukin-17 and its target genes: mechanisms of interleukin-17 function in disease. *Immunology*, 2010; 129(3):311-321.
17. Wu C, Yosef N, Thalhamer T, et al. Induction of pathogenic T H 17 cells by inducible salt-sensing kinase SGK1. *Nature*, 2013; 496(7446):513-517.
18. Funakoshi Y, Ichiki T, Shimokawa H, et al. Rho-kinase mediates angiotensin II-induced monocyte chemoattractant protein-1 expression in rat vascular smooth muscle cells. *Hypertension*, 2001; 38(1):100-104.
19. Ishizawa K, Yoshizumi M, Tsuchiya K, et al. Dual effects of endothelin-1 (1-31): induction of mesangial cell migration and facilitation of monocyte recruitment through monocyte chemoattractant protein-1 production by mesangial cells. *Hypertension research*, 2004; 27(6):433-440.
20. Fliser D, Buchholz K, Haller H. Antiinflammatory effects of angiotensin II subtype 1 receptor blockade in hypertensive patients with microinflammation. *Circulation*, 2004; 110(9):1103-1107.
21. Shen J, Morgan J, Tesch GH, et al. CCL2-dependent macrophage recruitment is critical for mineralocorticoid receptor-mediated cardiac fibrosis, inflammation, and blood pressure responses in male mice. *Endocrinology*, 2014; 155(3):1057-1066.
22. Chan CT, Moore JP, Budzyn K, et al. Reversal of vascular macrophage accumulation and hypertension by a CCR2 antagonist in deoxycorticosterone/salt-treated mice. *Hypertension*, 2012; 60(5):1207-1212.
23. Brands MW, Banes-Berceli AK, Inscho EW, et al. Interleukin 6 knockout prevents angiotensin II hypertension: role of renal vasoconstriction and janus kinase 2/signal transducer and activator of transcription 3 activation. *Hypertension*, 2010; 56(5):879-884.

24. Chamarthi B, Williams GH, Ricchiuti V, et al. Inflammation and hypertension: the interplay of interleukin-6, dietary sodium, and the renin–angiotensin system in humans. *American journal of hypertension*, 2011; 24(10):1143-1148.
25. Furuya Y, Satoh T, Kuwana M. Interleukin-6 as a potential therapeutic target for pulmonary arterial hypertension. *International journal of rheumatology*, 2010; 2010.
26. Falck-Hansen M, Kassiteridi C, Monaco C. Toll-like receptors in atherosclerosis. *International journal of molecular sciences*, 2013; 14(7):14008-14023.
27. Lin M, Tang SC. Toll-like receptors: sensing and reacting to diabetic injury in the kidney. *Nephrology Dialysis Transplantation*, 2014; 29(4):746-754.
28. Bauer EM, Shapiro R, Zheng H, et al. High mobility group box 1 contributes to the pathogenesis of experimental pulmonary hypertension via activation of Toll-like receptor 4. *Molecular Medicine*, 2012; 18(12):1509-1518.
29. Bomfim G, Szasz T, Carvalho M, et al. The Toll way to hypertension: role of the innate immune response. *Endocrinol Metabol Syndrom S*, 2011; 8:2161-1017.
30. Ann-Charlotte I. Inflammatory mechanisms in preeclampsia. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health*, 2013; 3(2):58.
31. Krishnan SM, Ling YH, Huuskes BM, et al. Pharmacological inhibition of the NLRP3 inflammasome reduces blood pressure, renal damage, and dysfunction in salt-sensitive hypertension. *Cardiovascular research*, 2019; 115(4):776-787.
32. Pasqua T, Pagliaro P, Rocca C, et al. Role of NLRP-3 inflammasome in hypertension: a potential therapeutic target. *Current Pharmaceutical Biotechnology*, 2018; 19(9):708-714.