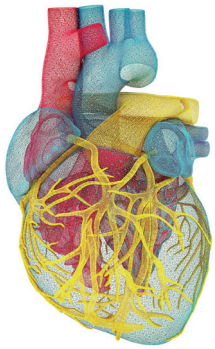

BÖLÜM **42**

Renal Arter Hastalığı ve Diyabet

Feride ÖZKARA [1]

GİRİŞ

Renal arter stenozu (RAS), sekonder hipertansiyonun ve buna bağlı gelişen renal yetmezliğin en sık görülen nedenleri arasında yer almaktadır. Böbrek perfüzyonunun azalmasına neden olan bu durumu oluşturan çoğu zaman (%90 sıklıkta) aterosklerotik renal arter stenozu (ARAS) veya fibromüsküler displazidir (FMD, %10 sıklıkta) (1,2). Ekstrinsik kompresyon, vaskülitler, konjenital bantlar, nörofibromatozis ve radyoterapi renal arter stenozunun ateroskleroz dışı nadir nedenleridir (2,3). Aterosklerotik lezyonların oluşumunda bilinen en önemli risk faktörü diabetes mellitustur (DM). Bu açıdan bakıldığında diyabetik hastalarda ARAS prevalansının genel hipertansif popülasyona kıyasla daha fazla olması beklenebilir (4). Ayrıca ARAS, renal parankimde iskemik değişikliklere yol açarak ciddi hipertansiyon ve renal yetmezliğe neden olmakta, bu durum diyabetin böbrek üzerindeki olumsuz etkilerini alevlendirmektedir (5). ARAS varlığı, hastaların medikal tedavisini de doğrudan etkilemekle birlikte; bu hastalarda renin-anjiyotensin-aldosteron sistemini (RAAS) inhibe eden medikal ajan kullanımı sonucunda renal perfüzyon bozulabilmekte ve akut böbrek hasarı gelişebilmektedir (6). Bu bölümde aterosklerotik renal arter stenozuna genel yaklaşım ve diyabet ile olan ilişkisi üzerinde durulacaktır.

EPİDEMİYOLOJİ

Aterosklerotik renal arter stenozu (ARAS), 65 yaş ve üzeri popülasyonun %6,8'inde görülmekte olup hipertansiyonlu hastalarda renovasküler hipertansiyon prevalansının %0.1 ile %5 civarında olduğu tahmin edilmektedir (7-10). ARAS prevalansı ayrıca hipertansiyonun ciddiyeti ile artar; örneğin, koroner ateroskleroz nedeniyle kateterizasyon uygulanan dirençli hipertansiyonu olan hastaların %14-24'ünde ARAS tespit edilmiştir (11-13). Ciddi (%50 üzerinde) stenoza neden olan lezyonların prevalansı; yaş, erkek cinsiyet, sigara, hiperlipidemi ve periferik arter hastalığı gibi geleneksel kardiyovasküler risk faktörleriyle artmaktadır (7). Aterosklerotik renal arter stenozunun başka komorbiditeler ile birlikteliği pek çok çalışmanın konusu olmuştur. En sık eşlik eden kronik hastalık kalp yetersizliğidir. De Sil-

[1] Uzm. Dr., Selendi Devlet Hastanesi, İç Hastalıkları Kliniği, ferideozkaraa@gmail.com

KAYNAKLAR

1. Textor SC, Lerman L. Renovascular hypertension and ischemic nephropathy. *American Journal of Hypertension* 2010, 23(11):1159-1169. doi: 10.1038/ajh.2010.174 [published Online First:2010/09/23]
2. Dieter RS, Schmidt WS, Pacanowski JP, et al. Renovascular hypertension. *Expert Review of Cardiovascular Therapy* 2005, 3(3):413-422. doi: 10.1586/14779072.3.3.413
3. Safian RD, Madder RD. Refining the approach to renal artery revascularization. *Journal of the American College of Cardiology; Cardiovasc Interventions* 2009, 2(3):161-174. doi: 10.1016/j.jcin.2008.10.014.
4. Sawicki PT, Kaiser S, Heinemann L, et al. Prevalence of renal artery stenosis in diabetes mellitus--an autopsy study. *Journal of Internal Medicine* 1991, 229(6):489-492. doi: 10.1111/j.1365-2796.1991.tb00382.x
5. Conlon PJ, O'Riordan E, Kalra PA. New insights into the epidemiologic and clinical manifestations of atherosclerotic renovascular disease. *American Journal of Kidney Diseases* 2000, 35(4):573-587. doi: 10.1016/s0272-6386(00)70002-3
6. Postma CT, Klappe EM, Dekker HM, et al. The prevalence of renal artery stenosis among patients with diabetes mellitus. *European Journal of Internal Medicine* 2012, 23(7):639-642. doi: 10.1016/j.ejim.2012.06.003 [published Online First:2021/06/23]
7. de Mast Q, Beutler JJ. The prevalence of atherosclerotic renal artery stenosis in risk groups: a systematic literature review. *Journal of Hypertension* 2009, 27(7):1333-1340. doi: 10.1097/HJH.0b013e328329bbf4
8. Lewin A, Blaufox MD, Castle H, et al. Apparent prevalence of curable hypertension in the Hypertension Detection and Follow-up Program. *Archives of Internal Medicine* 1985, 145(3):424-427.
9. Berglund G, Andersson O, Wilhelmsen L. Prevalence of primary and secondary hypertension: studies in a random population sample. *British Medical Journal* 1976, 2(6035):554-556. doi: 10.1136/bmj.2.6035.554
10. Foster JH, Dean RH, Pinkerton JA, et al. Ten years experience with the surgical management of renovascular hypertension. *Annals of Surgery* 1973, 177(6):755-766. doi: 10.1097/00000658-197306000-00015
11. Khosla S, Kunjummen B, Manda R, et al. Prevalence of renal artery stenosis requiring revascularization in patients initially referred for coronary angiography. *Catheterization and Cardiovascular Interventions* 2003, 58(3):400-403. doi: 10.1002/ccd.10387
12. Buller CE, Nogareda JG, Ramanathan K, et al. The profile of cardiac patients with renal artery stenosis. *Journal of the American College of Cardiology* 2004, 43(9):1606-1613. doi: 10.1016/j.jacc.2003.11.050
13. Benjamin MM, Fazel P, Filardo G, et al. Prevalence of and risk factors of renal artery stenosis in patients with resistant hypertension. *The American Journal of Cardiology* 2014, 113(4):687-690. doi: 10.1016/j.amjcard.2013.10.046 [published Online First:2013/11/23]
14. de Silva R, Loh H, Rigby AS, et al. Epidemiology, Associated Factors, and Prognostic Outcomes of Renal Artery Stenosis in Chronic Heart Failure Assessed by Magnetic Resonance Angiography. *The American Journal of Cardiology* 2007, 100(2):273-279. doi: 10.1016/j.amjcard.2007.02.098 [published Online First:2007/06/06]
15. Kalra PA, Guo H, Kausz AT, et al. Atherosclerotic renovascular disease in United States patients aged 67 years or older: Risk factors, revascularization, and prognosis. *Kidney International* 2005, 68(1):293-301. doi: 10.1111/j.1523-1755.2005.00406.x
16. Hansen KJ, Edwards MS, Craven TE, et al. Prevalence of renovascular disease in the elderly: A population-based study. *Journal of Vascular Surgery* 2002, 36(3):443-451. doi: 10.1067/mva.2002.127351
17. Crowley JJ, Santos RM, Peter RH, et al. Progression of renal artery stenosis in patients undergoing cardiac catheterization. *American Heart Journal* 1998, 136(5):913-918. doi: 10.1016/s0002-8703(98)70138-3
18. Benjamin MM, Fazel P, Filardo G, et al. Prevalence of and Risk Factors of Renal Artery Stenosis in Patients With Resistant Hypertension. *The American Journal of Cardiology* 2014, 113(4):687-690. doi: 10.1016/j.amjcard.2013.10.046 [published Online First:2013/11/23]
19. Carmelita M, Stefania R, Luca Z, et al. Prevalence of renal artery stenosis in patients undergoing cardiac catheterization. *Internal and Emergency Medicine* 2013, 8(5):401-408. doi: 10.1007/s11739-011-0624-5 [published Online First:2011/05/25]
20. Textor SC, Lerman LO. Paradigm Shifts in Atherosclerotic Renovascular Disease: Where Are We Now? *Journal of the American Society of Nephrology* 2015, 26(9):2074-2080. doi: 10.1681/ASN.2014121274 [published Online First:2015/04/13]
21. Gottam N, Nanjundappa A, Dieter RS. Renal artery stenosis: pathophysiology and treatment. *Expert Review of Cardiovascular Therapy* 2009, 7(11):1413-1420. doi: 10.1586/erc.09.109
22. Brewster UC, Setaro JF, Perazella MA. The renin-angiotensin-aldosterone system: cardiorenal effects and implications for renal and cardiovascular disease states. *The American Journal of the Medical Sciences* 2003, 326(1):15-24. doi: 10.1097/00000441-200307000-00003
23. Textor SC. Atherosclerotic renal artery stenosis: overtreated but underrated? *Journal of the American Society of Nephrology* 2008, 19(4):656-659. doi: 10.1681/ASN.2007111204 [published Online First:2008/01/30]
24. Textor SC. Current approaches to renovascular hypertension. *Medical Clinics of North America* 2009, 93(3):717-732, Table of Contents. doi: 10.1016/j.mcna.2009.02.012
25. Goldblatt H, Lynch J, Hanzal RF, et al. Studies On Experimental Hypertension : I. The Production Of Persistent Elevation Of Systolic Blood Pressure By Means Of Renal Ischemia. *Journal of Experimental Medicine* 1934, 59(3):347-379. doi: 10.1084/jem.59.3.347
26. Cohen JB, Townsend RR. Use of renin-angiotensin system blockade in patients with renal artery stenosis. *Clinical Journal of the American Society of Nephrology* 2014, 9(7):1149-1152. doi: 10.2215/CJN.04240414 [published Online First:2014/06/05]

27. Abela G. Peripheral Vascular Disease. USA; 2004.
28. Hocher B, George I, Rebstock J, et al. Endothelin system-dependent cardiac remodeling in renovascular hypertension. *Hypertension* 1999, 33(3):816-822. doi: 10.1161/01.hyp.33.3.816
29. Dworkin LD, Cooper CJ. Clinical practice. Renal-artery stenosis. *New England Journal of Medicine* 2009, 361(20):1972-1978. doi: 10.1056/NEJMcp0809200
30. Safian RD, Textor SC. Renal-Artery Stenosis. *New England Journal of Medicine* 2001, 344(6):431-442. doi: 10.1056/NEJM200102083440607
31. Diamond JR. Flash pulmonary edema and the diagnostic suspicion of occult renal artery stenosis. *American Journal of Kidney Diseases* 1993, 21(3):328-330. doi: 10.1016/s0272-6386(12)80756-6
32. Textor SC. Renal failure related to angiotensin-converting enzyme inhibitors. *Seminars in Nephrology* 1997, 17(1):67-76.
33. Caps MT, Zierler RE, Polissar NL, et al. Risk of atrophy in kidneys with atherosclerotic renal artery stenosis. *Kidney International* 1998, 53(3):735-742. doi: 10.1046/j.1523-1755.1998.00805.x
34. Hicks CW, Clark TWI, Cooper CJ, et al. Atherosclerotic Renovascular Disease: A KDIGO (Kidney Disease: Improving Global Outcomes) Controversies Conference. *American Journal of Kidney Diseases* 2022, 79(2):289-301. doi: 10.1053/j.ajkd.2021.06.025 [published Online First:2021/08/09]
35. Liang F, Hu DY, Wu MY, et al. The incidence of renal artery stenosis in the patients referred for coronary artery bypass grafting. *Indian Journal of Nephrology* 2012, 22(1):13-17. doi: 10.4103/0971-4065.91181
36. Wright JR, Shurrab AaE, Cooper A, et al. Progression of cardiac dysfunction in patients with atherosclerotic renovascular disease. *QJM: An International Journal of Medicine* 2009, 102(10):695-704. doi: 10.1093/qjmed/hcp105 [published Online First:2009/08/10]
37. Williams GJ, Macaskill P, Chan SF, et al. Comparative accuracy of renal duplex sonographic parameters in the diagnosis of renal artery stenosis: paired and unpaired analysis. *American Journal of Roentgenology* 2007, 188(3):798-811. doi: 10.2214/AJR.06.0355
38. Davies MG, Saad WE, Bismuth J, et al. Renal parenchymal preservation after percutaneous renal angioplasty and stenting. *Journal of Vascular Surgery* 2010, 51(5):1222-1229. doi: 10.1016/j.jvs.2009.09.050 [published Online First:2010/02/09]
39. Radermacher J, Chavan A, Bleck J, et al. Use of Doppler ultrasonography to predict the outcome of therapy for renal-artery stenosis. *New England Journal of Medicine* 2001, 344(6):410-417. doi: 10.1056/NEJM200102083440603
40. Soulez G, Therasse E, Qanadli SD, et al. Prediction of clinical response after renal angioplasty: respective value of renal Doppler sonography and scintigraphy. *American Journal of Roentgenology* 2003, 181(4):1029-1035. doi: 10.2214/ajr.181.4.1811029
41. Soares GM, Murphy TP, Singha MS, et al. Renal Artery Duplex Ultrasonography as a Screening and Surveillance Tool to Detect Renal Artery Stenosis. *Journal of Ultrasound in Medicine* 2006, 25(3):293-298. doi: 10.7863/jum.2006.25.3.293
42. Davenport MS, Khalatbari S, Dillman JR, et al. Contrast Material–induced Nephrotoxicity and Intravenous Low-Osmolality Iodinated Contrast Material. *Radiology* 2013, 267(1):94-105. doi: 10.1148/radiol.12121394 [published Online First:2013/01/29]
43. Tan KT, van Beek EJR, Brown PWG, et al. Magnetic Resonance Angiography for the Diagnosis of Renal Artery Stenosis: A Meta-analysis. *Clinical Radiology* 2002, 57(7):617-624. doi: 10.1053/crad.2002.0941
44. Grobner T. Gadolinium – a specific trigger for the development of nephrogenic fibrosing dermopathy and nephrogenic systemic fibrosis? *Nephrology Dialysis Transplantation* 2006, 21(4):1104-1108. doi: 10.1093/ndt/gfk062 [published Online First:2006/01/23]
45. Woolen SA, Shankar PR, Gagnier JJ, et al. Risk of Nephrogenic Systemic Fibrosis in Patients With Stage 4 or 5 Chronic Kidney Disease Receiving a Group II Gadolinium-Based Contrast Agent: A Systematic Review and Meta-analysis. *Journal of the American Medical Association Internal Medicine* 2020, 180(2):223-230. doi: 10.1001/jamainternmed.2019.5284
46. Kramer U, Wiskirchen J, Fenchel MC, et al. Isotropic High-Spatial-Resolution Contrast-enhanced 3.0-T MR Angiography in Patients Suspected of Having Renal Artery Stenosis. *Radiology* 2008, 247(1):228-240. doi: 10.1148/radiol.2471070565 [published Online First:2008/02/12]
47. Caridi JG, Stavropoulos SW, Hawkins IF. CO2 digital subtraction angiography for renal artery angioplasty in high-risk patients. *American Journal of Roentgenology* 1999, 173(6):1551-1556. doi: 10.2214/ajr.173.6.10584800
48. Abumoawad A, Saad A, Ferguson CM, et al. Tissue hypoxia, inflammation, and loss of glomerular filtration rate in human atherosclerotic renovascular disease. *Kidney International* 2019, 95(4):948-957. doi: 10.1016/j.kint.2018.11.039
49. Gloviczki ML, Saad A, Textor SC. Blood oxygen level-dependent (BOLD) MRI analysis in atherosclerotic renal artery stenosis. *Current Opinion in Nephrology and Hypertension* 2013, 22(5):519-524. doi: 10.1097/MNH.0b013e32836400b2
50. Katsiki N, Fonseca V, Mikhailidis DP. Contrast-induced acute kidney injury in diabetes mellitus: Clinical relevance and predisposing factors. Could statins be of benefit? *Journal of Diabetes and its Complications* 2018, 32(11):982-984. doi: 10.1016/j.jdiacomp.2018.08.008 [published Online First:2018/08/10]
51. van der Molen AJ, Reimer P, Dekkers IA, et al. Post-contrast acute kidney injury. Part 2: risk stratification, role of hydration and other prophylactic measures, patients taking metformin and chronic dialysis patients : Recommendations for updated ESUR Contrast Medium Safety Committee guidelines. *European Radiology* 2018, 28(7):2856-2869. doi: 10.1007/s00330-017-5247-4 [published Online First:2018/02/07]
52. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/

NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension* 2018, 71(6):1269-1324. doi: 10.1161/HYP.0000000000000066

53. Williams B, Mancia G, Spiering W, et al. 2018 Practice Guidelines for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension: ESC/ESH Task Force for the Management of Arterial Hypertension. *Journal of Hypertension* 2018, 36(12). doi: 10.1097/HJH.0000000000001961
54. KDIGO 2021 Clinical Practice Guideline for the Management of Blood Pressure in Chronic Kidney Disease. *Kidney International* 2021, 99(3s):S1-s87. doi: 10.1016/j.kint.2020.11.003
55. Imber I, Clymer RH. Obstruction of the Renal Artery Producing Malignant Hypertension. *New England Journal of Medicine* 1955, 252(8):301-304. doi: 10.1056/NEJM195502242520802
56. Hollenberg NK. The treatment of renovascular hypertension: surgery, angioplasty, and medical therapy with converting-enzyme inhibitors. *American Journal of Kidney Diseases* 1987, 10(1 Suppl 1):52-60
57. Hackam DG, Duong-Hua ML, Mamdani M, et al. Angiotensin inhibition in renovascular disease: A population-based cohort study. *American Heart Journal* 2008, 156(3):549-555. doi: 10.1016/j.ahj.2008.05.013 [published Online First:2008/07/21]
58. Losito A, Gaburri M, Errico R, et al. Survival of patients with renovascular disease and ACE inhibition. *Clinical Nephrology* 1999, 52(6):339-343.
59. Chrysochou C, Foley RN, Young JF, et al. Dispelling the myth: the use of renin–angiotensin blockade in atheromatous renovascular disease. *Nephrology Dialysis Transplantation* 2012, 27(4):1403-1409. doi: 10.1093/ndt/gfr496 [published Online First:2011/10/12]
60. Hall JE, Guyton AC, Jackson TE, et al. Control of glomerular filtration rate by renin-angiotensin system. *American Journal of Physiology* 1977, 233(5):F366-372. doi: 10.1152/ajprenal.1977.233.5.F366
61. Textor SC, Novick AC, Steinmuller DR, et al. Renal Failure Limiting Antihypertensive Therapy as an Indication for Renal Revascularization: A Case Report. *Archives of Internal Medicine* 1983, 143(11):2208-2211.
62. Keddis MT, Garovic VD, Bailey KR, et al. Ischaemic nephropathy secondary to atherosclerotic renal artery stenosis: clinical and histopathological correlates. *Nephrology Dialysis Transplantation* 2010, 25(11):3615-3622. doi: 10.1093/ndt/gfq269 [published Online First:2010/05/25]
63. Drummond CA, Brewster PS, He W, et al. Cigarette smoking and cardio-renal events in patients with atherosclerotic renal artery stenosis. *PLOS ONE* 2017, 12(3):e0173562. doi: 10.1371/journal.pone.0173562
64. Tuttle KR, Dworkin LD, Henrich W, et al. Effects of Stenting for Atherosclerotic Renal Artery Stenosis on eGFR and Predictors of Clinical Events in the CORAL Trial. *Clinical Journal of the American Society of Nephrology* 2016, 11(7):1180-1188. doi: 10.2215/CJN.10491015 [published Online First:2016/05/25]
65. Stanley JC. The evolution of surgery for renovascular occlusive disease. *Cardiovascular Surgery* 1994, 2(2):195-202.
66. Novick AC, Ziegelbaum M, Vidt DG, et al. Trends in Surgical Revascularization for Renal Artery Disease: Ten Years' Experience. *Journal of the American Medical Association* 1987, 257(4):498-501.
67. Plouin PF, Chatellier G, Darné B, et al. Blood pressure outcome of angioplasty in atherosclerotic renal artery stenosis: a randomized trial. Essai Multicentrique Medicaments vs Angioplastie (EMMA) Study Group. *Hypertension* 1998, 31(3):823-829. doi: 10.1161/01.hyp.31.3.823
68. van Jaarsveld BC, Krijnen P, Pieterman H, et al. The effect of balloon angioplasty on hypertension in atherosclerotic renal-artery stenosis. Dutch Renal Artery Stenosis Intervention Cooperative Study Group. *New England Journal of Medicine* 2000, 342(14):1007-1014. doi: 10.1056/NEJM200004063421403
69. Webster J, Marshall F, Abdalla M, et al. Randomised comparison of percutaneous angioplasty vs continued medical therapy for hypertensive patients with atheromatous renal artery stenosis. *Journal of Human Hypertension* 1998, 12(5):329-335. doi: 10.1038/sj.jhh.1000599
70. Wheatley K, Ives N, Gray R, et al. Revascularization versus medical therapy for renal-artery stenosis. *New England Journal of Medicine* 2009 Nov 12;361(20):1953-62. doi: 10.1056/NEJMoa0905368
71. Cooper CJ, Murphy TP, Cutlip DE, et al. CORAL Investigators. Stenting and medical therapy for atherosclerotic renal-artery stenosis. *New England Journal of Medicine* 2014 Jan 2;370(1):13-22. doi: 10.1056/NEJMoa1310753 [published Online First:2013/11/18]
72. Green D, Ritchie JP, Chrysochou C, et al.Revascularization of atherosclerotic renal artery stenosis for chronic heart failure versus acute pulmonary oedema. *Nephrology* 2018, 23(5):411-417. doi: 10.1111/nep.13038
73. Ritchie J, Green D, Chrysochou C, et al. High-Risk Clinical Presentations in Atherosclerotic Renovascular Disease: Prognosis and Response to Renal Artery Revascularization. *American Journal of Kidney Diseases* 2014, 63(2):186-197. doi: 10.1053/j.ajkd.2013.07.020 [published Online First:2013/09/26]
74. Marone LK, Clouse WD, Dorer DJ, et al. Preservation of renal function with surgical revascularization in patients with atherosclerotic renovascular disease. *Journal of Vascular Surgery* 2004, 39(2):322-329. doi: 10.1016/j.jvs.2003.10.023
75. Bhalla V, Textor SC, Beckman JA, et al. American Heart Association Council on the Kidney in Cardiovascular Disease; Council on Hypertension; Council on Peripheral Vascular Disease; and Council on Cardiovascular Radiology and Intervention. Revascularization for Renovascular Disease: A Scientific Statement From the American Heart Association. *Hypertension*. 2022 Aug;79(8):e128-e143. doi: 10.1161/HYP.0000000000000217 [published Online First:2022/06/16]