

## Bölüm 9

# KONJENİTAL ADRENAL HİPERPLAZİ HİPERTANSİYON İLİŞKİSİ

Tülay OMMA<sup>1</sup>

### GİRİŞ

Hipertansiyon (HT) erişkin hipertansif popülasyonun yaklaşık %15'inde hormonal bir bozukluk ile ilişkilidir. Bunların çoğunluğunu pirimer aldosteronizm oluşturur (1, 2). Bununla birlikte seçilmiş adölesan ve erişkin hipertansif hastalarda konjenital adrenal hiperplazi (KAH) olarak bilinen kalıtsal steroidojenik defektler de akla gelmelidir.

KAH, kolesterolden kortizol biyosentezine kadar olan biyokimyasal yolda rol alan protein ve enzimlerden birinde genetik defekt ile karakterize bir bozukluktur. Kortizol sentezindeki eksiklik sonucu hipofiz bezi üzerinde kortizol negatif feedback aksı bozulur ve hipofiz bezinden kortikotropin (ACTH) üretimi artar. Artan ACTH ise adrenal hiperplazi ve adrenal steroidlerin fazla üretilmesine neden olur. Klinik özellikler defekt olan enzim bölgesine bağlı olarak kortizol, mineralokortikoid (MK) ve androjenlerin artmış ya da azalmış hızına göre şekillenir. KAH genel olarak klasik ve nonklasik (geç başlangıçlı, NKAH) olarak iki gruba ayrılır. Klasik tip ise enzimatik aktivitenin hemen hemen yok olduğu 'tuz kaybettiren form' ve % 1-2 enzimatik aktivitenin bulunduğu 'basit virilizan' tip şeklinde iki gruba ayrılır.

Tüm dünyada KAH'ın en sık nedeni (>%90) 21 hidrosilaz enzim eksikliğidir. Enzim eksikliklerinin prevalansı coğrafi bölgeye göre değişmektedir. Ülkemizde ise 11 beta hidrosilaz eksikliği daha fazla görülmektedir. Bu iki enzim sadece adrenal bezde eksprese edilirler. Diğer nadir tipler olan yan zincir klivaj (P450scc) enzimi, 17 alfa hidrosilaz ve 3 beta hidrosisteroid dehidrogenaz enzim eksikliğinde, bu üç enzim hem adrenal hem de gonadlarda eksprese edildiğinden hem

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**Tablo 6: KAH'da yıllık takip planı**

	Sonlanım	Gerekçe	Ölçüm
<b>Kısa Dönem</b>	1.Büyüme hızı 2.Kilo değişikliği 3.Doğru tedavi doz 4.Kan basıncı 5.Puberte	1.Kontrol 2.Doz ayarı 3.Optimize tedavi 4.Tedavi etkileri 5.KAH da zamanlama değişebilir	1.>2cm/yıl ise dikkat 2.>2kg/yıl ise dikkat 3.1 ve 2.maddeler ve kan testleri 4.Kan basıncını karta işle 5.Muayene
<b>Orta Dönem</b>	1.Kemik maturasyonu 2.Pubertal durum 3.Hidro kortizon dozu 4.Fludrokortizon dozu 5.Testis ve over sağlığı 6.Metabolik durum	1.İskelet maturasyon hızı 2.Erken puberte, hızlı gelişim 3.Optimize tedavi 4.Hipertansiyondan kaçın 5.KAH'ın gonad etkisi 6.İnsülin duyarlılığı ve lipidler	1.Yıllık kemik yaşı 2.Tanner evrelemesi 3.Kortizol ve 17OHP 4.Plazma renin aktivitesi 5.Kızlarda pelvik USG Erkeklerde dikkatli muayene 6.Açlık glukoz, insülin,lipidler
<b>Uzun Dönem</b>	1.Büyüme 2.Kemik mineralizasyonu 3.Fertilite 4.Kardiyovasküler risk	1. Sonuçlar 2.KAH/tedavinin kemik üzerine etkisi 3.KAH etkisi 4.KAH/tedavi etkisi	1.Final boy 2.DXA tarama 3.Kızlarda menstrüel siklus, Erkeklerde testiste adrenal rest tümör 4.Açlık glukoz, insülin,kan basıncı,açlık lipidler

## KAYNAKLAR

- Hinz L, Pacaud D, Kline G. Congenital adrenal hyperplasia causing hypertension: an illustrative review. *J Hum Hypertens*. 2018 Feb;32(2):150-157. doi: 10.1038/s41371-017-0002-5.
- Rossi GP. A comprehensive review of the clinical aspects of primary aldosteronism. *Nat Rev Endocrinol*. 2011;7:485-95.
- Akyürek N, Atabek ME, Eklioğlu BS ve ark. Ambulatory blood pressure and subclinical cardiovascular disease in patients with congenital adrenal hyperplasia: a preliminary report. *J Clin Res Pediatr Endocrinol*. 2015;7:13-8.
- Ardhanari S, Kannuswamy R, Chaudhary K ve ark. Mineralocorticoid and apparent mineralocorticoid syndromes of secondary hypertension. *Adv Chronic Kidney Dis*. 2017;22:185-95
- Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s24)*.Londra:Elsevier
- Li H, Qiao J, Guo H. 17-Alpha-hydroxylase deficiency: a case report with clinical and molecular analysis. *Gynecol Endocrinol*.2010;26:521-3.
- Costa-Santos M, Kater CE, Auchus RJ, Brazilian Congenital Adrenal Hyperplasia Multicen-

- ter Study Group. Two prevalent CYP17 mutations and genotype-phenotype correlations in 24 Brazilian patients with 17-hydroxylase deficiency. *J Clin Endocrinol Metab* 2004; 89:49.
8. Zennaro MC, Boulkroun S, Fernandes-Rosa F. Inherited forms of mineralocorticoid hypertension. *Best Pract Res Clin Endocrinol Metab*. 2015 Aug;29(4):633-45. doi: 10.1016/j.beem.2015.04.010.
  9. Pappachan JM, Buch HN. Endocrine hypertension: a practical approach. *Adv Exp Med Biol*. 2017;956:215-237. doi: 10.1007/5584\_2016\_26
  10. Biglieri E. Rare causes of adrenocortical hypertension. *Cardiology*. 1985;72:70-5.
  11. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s58).Londra:Elsevier*
  12. Kater C, Biglieri E. Disorders of steroid 17 alpha-hydroxylase deficiency. *Endocrinol Metab Clin North Am*. 1994;23:341-57.
  13. Wong S-L, Shu S-G, Tsai C-R. Seventeen alpha-hydroxylase deficiency. *J Formos Med Assoc*. 2006;105:177-81.
  14. Kater C, Biglieri E, Brust N, ve ark. The unique patterns of plasma aldosterone and 18-hydroxycorticosterone concentrations in the 17a-hydroxylase deficiency syndrome. *JCEM*. 1982;55:295-302.
  15. White PC. Inherited forms of mineralocorticoid hypertension. *Hypertension*. 1996;28:927-36.
  16. Saruta T, Kondo K, Saito I ve ark. Control of aldosterone in 17a-hydroxylase deficiency. *Horm Res*. 1980;13:98-108.
  17. Bassett MH, White PC, Rainey WE. The regulation of aldosterone synthase expression. *Mol Cell Endocrinol*. 2004;217:67-74.
  18. Biglieri EG, Herron MA, Brust N. 17-hydroxylation deficiency in man. *J Clin Invest* 1966; 45:1946.
  19. Hassan-smith Z, Stewart PM. Inherited forms of mineralocorticoid hypertension. *Curr Opin Endocrinol Diabetes Obes*.2011;18:177-85.
  20. Britten FL, Ulett KB, Duncan EL ve ark. Primary amenorrhea with hypertension: undiagnosed 17-a-hydroxylase deficiency. *Med J Aust*. 2013;199:556-8.
  21. Olson CA, Crudo DF. Case report pubertal delay, hypokalemia, and hypertension caused by a rare form of congenital adrenal hyperplasia. *J Pediatr Adolesc Gynecol*. 2011;24:e29-31.
  22. Aydin Z, Ozturk S, Gursu M. Male pseudohermaphroditism as a cause of secondary hypertension:a case report. *Endocrine*.2010;38:100-3.
  23. Auchus RJ. Steroid 17-hydroxylase and 17,20-lyase deficiencies, genetic and pharmacologic. *J Steroid Biochem Mol Biol* 2017; 165:71.
  24. Auchus RJ, Lee TC, Miller WL. Cytochrome b5 augments the 17,20-lyase activity of human P450c17 without direct electron transfer. *J Biol Chem* 1998; 273:3158.
  25. D'Armiento M, Reda G, Kater C ve ark. 17 Alpha-hydroxylase deficiency: mineralocorticoid hormone profiles in an affected family. *J Clin Endocrinol Metab*. 1983;56:697-701.
  26. Cottrell D, Bello F, Falko J. Case report: 17 alpha-hydroxylase deficiency masquerading as primary hyperaldosteronism. *Am J Med Sci*. 1990;300:380-2.
  27. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s59).Londra:Elsevier*
  28. Kim YM, Kang M, Choi JH ve ark. A review of the literature on common CYP17A1 mutations in adults with 17-hydroxylase/17,20-lyase deficiency, a case series of such mutations among Koreans and functional characteristics of a novel mutation. *Metabolism* 2014;63:42-9.
  29. Li H, Qiao J, Guo H. 17-Alpha-hydroxylase deficiency: a case report with clinical and molecular analysis. *Gynecol Endocrinol*.2010;26:521-3.
  30. Yamakita N, Murase J, Yasuda K ve ark. Possible Hyperaldosteronism and Discrepancy in Enzyme Activity Deficiency in Adrenal and Gonadal Glands in Japanese Patients with 17a-Hydroxylase Deficiency. *Endocrinol Jpn*. 1989;36:515-36.
  31. Yanase T, Simpson E, Waterman M. 17 Alpha-hydroxylase/ 17,20-lyase deficiency: from clinical investigation to molecular definition. *Endocr Rev*. 1991;12:91-108.

32. Miura K, Yasuda K, Yanase T ve ark. Mutation of cytochrom P-45017 a gene (CYP17) in a Japanese patient previously reported as having glucocorticoidresponsive hyperaldosteronism: with a review of Japanese patients with mutations of CYP17. *J Clin Endocrinol Metab.* 1996;81:3797–801.
33. Toh VKL, Yung CH. A young woman with hypogonadism, hypertension and hypokalaemia. *Med J Malaysia.* 2009;64:242–3.
34. UpToDate(2019) Uncommon congenital adrenal hyperplasias (30/07/2019 tarihinde [https://www.uptodate.com/contents/uncommon-congenital-adrenal-hyperplasias/print?search=congenital%20adrenal%20hyperplasia&source=search\\_result&selectedTitle=1~125&usage\\_type=default&display\\_rank=1](https://www.uptodate.com/contents/uncommon-congenital-adrenal-hyperplasias/print?search=congenital%20adrenal%20hyperplasia&source=search_result&selectedTitle=1~125&usage_type=default&display_rank=1) adresinden ulaşılmıştır)
35. Kater CE, Biglieri EG, Brust N ve ark. The unique patterns of plasma aldosterone and 18-hydroxycorticosterone concentrations in the 17 alpha-hydroxylase deficiency syndrome. *J Clin Endocrinol Metab* 1982; 55:295.
36. New M. Hypertension in congenital adrenal hyperplasia and apparent mineralocorticoid excess. *Ann N Y Acad Sci.* 2002;970:145–54.
37. Valsalan R, Zimmermann A. Ambiguous genitalia and hypertension in a patient with congenital adrenal hyperplasia. *Intern Med J.* 2013;43:334–7.
38. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s51).Londra:Elsevier*
39. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s54).Londra:Elsevier*
40. Khattab A, Haider S, Kumar A ve ark. Clinical, genetic, and structural basis of congenital adrenal hyperplasia due to 11  $\beta$ -hydroxylase deficiency. *Proc Natl Acad Sci USA.* 2017;114:E1933–40.
41. Dluhy RG. Screening for genetic causes of hypertension. *Curr Hypertens Rep.* 2002;4:439–44.
42. Al-mograbı H, Abu-odeh A, Hababbeh Z ve ark. Hypertension in children with ambiguous genitalia: six cases. *Saudi J Kidney Dis Transpl.* 2004;15:157–66.
43. Parsa AA, New M. Low-renin hypertension of childhood. *Endocrinol Metab Clin North Am.* 2011;40:369–77.
44. Speiser PW & White PC. Congenital adrenal hyperplasia. *New England Journal of Medicine* 2003 349 776–788. (doi:10.1056/NEJMra021561)
45. Polat S, Kulle A, Karaca Z et al. Characterisation of three novel CYP11B1 mutations in classic and non-classic 11 $\beta$ -hydroxylase deficiency. *Eur J Endocrinol.* 2014 Apr 10;170(5):697-706. doi: 10.1530/EJE-13-0737
46. White PC, Curnow KM, Pascoe L. Disorders of steroid 11 beta-hydroxylase isozymes. *Endocr. Rev.* 15(4), 421–438 (1994). doi:10.1210/edrv-15-4-421
47. Oberman AS, Flatau E, Luboshitzky R. Bilateral testicular adrenal rests in a patient with 11-hydroxylase deficient congenital adrenal hyperplasia. *J. Urol.* 149(2), 350–352 (1993)
48. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s52).Londra:Elsevier*
49. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s53).Londra:Elsevier*
50. Kacem M, Moussa A, Khochtali I ve ark. Bilateral adrenalectomy for severe hypertension in congenital adrenal hyperplasia due to 11 B-hydroxylase deficiency: long term follow-up. *Ann Endocrinol.* 2009;70:113–8.
51. Falhammar H, Thorén M, Calissendorff J. Thyrotoxic periodic paralysis: clinical and molecular aspects. *Endocrine* 43(2),274–284 (2013). doi:10.1007/s12020-012-9777
52. Lashansky G, Saenger P, Dimartino-Nardi J ve ark. Normative data for the steroidogenic response of mineralocorticoids and their precursors to adrenocorticotropin in a healthy pediatric population. *J Clin Endocrinol Metab* 1992; 75:1491.
53. Kuribayashi I, Nomoto S, Massa G ve ark. Steroid 11-b-hydroxylase deficiency caused by compound heterozygosity for a novel mutation, p.G314R, in one CYP11B1 allele, and a chimeric

- CYP11B2/CYP11B1 in the other allele. *Hormone Research* 2005 63 284–293. (doi:10.1159/000087074)
54. White PC & Speiser PW. Congenital adrenal hyperplasia due to 21-hydroxylase deficiency. *Endocrine Reviews* 2000 21 245–291.
  55. White PC, Dupont J, New MI ve ark. A mutation in CYP11B1 (Arg-448----His) associated with steroid 11 beta-hydroxylase deficiency in Jews of Moroccan origin. *J Clin Invest* 1991; 87:1664.
  56. Chemaitilly W, Wilson RC, New MI. Hypertension and adrenal disorders. *Curr Hypertens Rep.* 2003;5:498–504.
  57. Chabre O, Portrat-doyen P, Chaffanjon P ve ark. Bilateral laparoscopic adrenalectomy for congenital adrenal hyperplasia with severe hypertension, sites of CYP11B1. *J Clin Endocrinol Metab.* 2000;85:4060–8.
  58. Speiser PW, Arlt W, Auchus RJ, Baskin LS, Conway GS, Merke DP, Meyer-Bahlburg HFL, Miller WL, Murad MH, Oberfield SE, White PC: Congenital Adrenal Hyperplasia Due to Steroid 21-Hydroxylase Deficiency: An Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab.* 2018 Nov 1;103(11):4043-4088. doi: 10.1210/jc.2018-01865.
  59. Hindmarsh P.C., Geertsma K.(2017) *Congenital Adrenal Hyperplasia A Comprehensive Guide içinde (s115).Londra:Elsevier*
  60. Bolu Ş.E. ve Adrenal ve Gonad Hastalıkları Çalışma Grubu.(2019).Türkiye Endokrinoloji ve Metabolizma Derneği Adrenal ve Gonadal Hastalıklar Kılavuzu .14.baskı (sayfa 87-95 ve sayfa 271-288) Ankara:BAYT Bilimsel Araştırmalar Basın Yayın ve Tanıtım Ltd. Şti