

Bölüm 13

LİDDLE SENDROMUNA BAĞLI HİPERTANSİYON

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GİRİŞ

Esansiyel hipertansiyon genetik faktörler ve yaşam tarzı faktörleri arasındaki kompleks ilişkiden kaynaklanan multifaktöryel bir durumdur ve pozitif aile öyküsü yüksek kan basıncı gelişme riskini arttırrır (1). Hipertansif hastaların küçük bir kısmının etyolojisinde kalıtımsal hastalıklar bulunabilir. Liddle sendromu da aldosterondan bağımsız sodyum geri alımına neden olan epitelyal sodyum kanallarının (ENaK) nokta mutasyonları tarafından meydana gelir (2). Liddle sendromu otozomal dominant geçişli, monogenik hipertansiyonun en yaygın tipidir (3).

PATOGENEZ

ENaK distal nefronun epitelyal hücrelerinin apikal kısmında lokalize, amilorid spesifik epitelyal sodyum kanallarıdır (4). Bu kanallar, renal dış meduller potasyum kanalları ve Na/K/ATPaz kanalları ile sodyum geri alımı ve elektrolit dengeşinde esas kanallardır (5). ENaK, SCNN1A, SCNN1B ve SCNN1G tarafından kodlanan 3 homolog alt birimden (α, β, γ) oluşan heteromerik bir komplekstir (6). SCNN1A, 12p13.31 kromozomunda lokalize iken, SCNN1B ve SCNN1G, 16p12.2 kromozomunda lokalizedir. α alt birimi tek başına Na akımını yeterli biçimde sağlayabılırken, 3 alt birimin etkileşimi en üst seviyede amilorid duyarlı Na akımını sağlar (5). 3 alt birimin amino asit sekansları %30-40'ı benzer ve protein yapıları büyük bir esktrasellüler loop, 2 transmembran domain (TM1 ve TM2 diye adlandırılan) ve 2 kısa hücre içi N ve C terminalden oluşan birbirlerine çok benzer yapılardır (7). 3 ENaK alt grubunun C terminali içinde PY (Prolin, Tyrozine) motif olarak adlandırılan yüksek derecede korunmuş bir sekans bulunmaktadır.

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Amilorid tedavisi gebe hastalarda kan basıncını ve potasyum seviyesini düzeltir, güvenli şekilde verilebilir.(33). Triamteren folik asit metabolizmasını bozduğu için gebe hastalarda önerilmez. Gebe hastalarda amilorid dozu 5-10 mg olarak verilebilir, gestasyon yaşı arttıkça ENaK α subuniti arttığı için kan basıncını kontrol etmek için amilorid dozu günde 2 kez verilmek üzere 30 mg kadar çıkarılabilir. Hem triamterenin hem de amiloridin emzirmede güvenliği bilinmemektedir bu nedenle emzirilen bebeğin yakından izlenmesi gerekmektedir(34)

Sonuç olarak; genç hipertansif bireylerde, hipertansiyonun aile öyküsü de mevcut ise ayırıcı tanıda, Liddle sendromu akılda tutulmalıdır.

KAYNAKLAR

1. Burrello J, Monticone S, Buffalo F, Tetti M, Veglio F, Williams T.A, Mulatero P. Is there a role for genomics in the management of hypertension: Int. J. Mol. Sci. 2017, 18, E1131.
2. Tetti M, Monticone S, Burrello J, Matarazzo P, Veglio F, Pasini B, Jeunemaitre X, Mulatero P; Liddle Syndrome: Review of the literature and description of a new case: Int. J. Mol. Sci. 2018, 19:812
3. Wang LP, Gao LG, Zhou XL et al. Genetic diagnosis of Liddle's syndrome by mutation analysis of SCNN1B and SCNN1G in a Chinese family. Chin. Med. J. (Engl) 2012;125:1401-4.
4. Canessa C.M, Schild L, Buell G, Thorens B, Gautschi I, Horisberger J.D, Rossier B.C. Amiloride-sensitive epithelial Na⁺ channel is made of three homologous subunits. Nature 1994, 367:463-467.
5. Hanukoglu I, Hanukoglu A, Epithelial sodium channel (ENaC) family: Phylogeny, structure-function, tissue distribution, and associated inherited diseases. Gene 2016, 579:95-132.
6. Jasti J, Furukawa H, Gonzales E.B, Gouaux E. Structure of acid-sensing ion channel 1 at 1.9 Å resolution and low pH. Nature 2007, 449:316-323.
7. Kashlan O.B, Adelman J.L, Okumura S, Blobner B.M, et al. Constraint-based, homology model of the extracellular domain of the epithelial Na⁺ channel α subunit reveals a mechanism of channel activation by proteases. J. Biol. Chem. 2011, 286: 649-660.
8. Butterworth, M.B. Regulation of the epithelial sodium channel (ENaC) by membrane trafficking. Biochim. Biophys. Acta 2010, 1802: 1166-1177.
9. Kamynina E, Staub O. Concerted action of ENaC, Nedd4-2, and Sgk1 in transepithelial Na⁺ transport. Am J Physiol Renal Physiol. 2002;283:F377- F387.
10. Knight KK, Olson DR, Zhou R, Snyder PM. Liddle's syndrome mutations increase Na⁺ transport through dual effects on epithelial Na⁺ channel surface expression and proteolytic cleavage. Proc Natl Acad Sci U S A. 2006;103:2805-2808.
11. Snyder PM, Price MP, McDonald FJ, Adams CM, Volk KA, Zeiher BG, Stokes JB, Welsh MJ. Mechanism by which Liddle's syndrome mutations increase activity of a human epithelial Na⁺ channel. Cell. 1995;83:969- 978.
12. Nesterov V, Krueger B, Bertog M, Dahlmann A, Palmisano R, Korbmacher C. In Liddle Syndrome, Epithelial Sodium Channel Is Hyperactive Mainly in the Early Part of the Aldosterone-Sensitive Distal Nephron. Hypertension. 2016;67:1256-1262.
13. Shimkets R.A, Warnock D.G, Bositis C.M, Nelson-Williams C, Hansson J.H, Schambelan M, Gill J.R, Ulrich S, Milora R.V, et al. Liddle's syndrome: Heritable human hypertension caused by mutations in the β subunit of the epithelial sodium channel. Cell 1994, 79:407-414.
14. Hansson J.H, Nelson-Williams C, Suzuki H, Schild L, Shimkets R, Lu Y, Canessa C, Iwasaki T, Rossier B.C, Lifton R.P. Hypertension caused by a truncated epithelial sodium channel γ subunit: Genetic heterogeneity of Liddle syndrome. Nat. Genet. 1995, 11: 76-82.
15. Hiltunen T.P, Hannila-Handelberg T, Petäjäniemi N, Kantola I, Tikkannen I, Virtamo J, Gautschi I, Schild L, Kontula K. Liddle's syndrome associated with a point mutation in the extra-

- cellular domain of the epithelial sodium channel γ subunit. *J. Hypertens.* 2002, 20:2383–2390
- 16. Nesterov V, Dahlmann A, Krueger B, Bertog M, Loffing J, Korbmacher C. Aldosterone-dependent and -independent regulation of the epithelial sodium channel (ENaC) in mouse distal nephron. *Am. J. Physiol. Renal Physiol.* 2012, 303:F1289–F1299
 - 17. Furuhashi M, Kitamura K, Adachi M et al. Liddle's syndrome caused by a novel mutation in the proline-rich PY motif of the epithelial sodium channel beta-subunit. *J Clin Endocrinol Metab.* 2005;90(1):340
 - 18. Wang Y, Liu Z, Hua Q, Chen Y, Cai Y, Liu R. Association of epithelial sodium channel β -subunit common polymorphism with essential hypertension families in a Chinese population. *Cell Biochem Biophys.* 2014, 70: 1277–1282
 - 19. Büssel C.J, Scurrah K.J, Ellis J.A, Harrap S.B. Selective genotyping reveals association between the epithelial sodium channel γ -subunit and systolic blood pressure. *Hypertension* 2007, 50:672–678.
 - 20. Tong, Q.; Menon, A.G.; Stockand, J.D. Functional polymorphisms in the α -subunit of the human epithelial Na⁺ channel increase activity. *Am. J. Physiol. Renal Physiol.* 2006, 290: F821–F827.
 - 21. Liu K, Qin F, Sun X, Zhang Y, Wang J, Wu Y, Ma W, Wang W, Wu X, Qin Y. Analysis of the genes involved in Mendelian forms of low-renin hypertension in Chinese early-onset hypertensive patients. *J. Hypertens.* 2018 36(3):502-509.
 - 22. Wang LP, Yang KQ, Jiang XJ, et al. Prevalence of Liddle Syndrome Among Young Hypertension Patients of Undetermined Cause in a Chinese Population. *J Clin Hypertens* 2015 Nov;17(11):902-7
 - 23. Pagani L, Diekmann Y, Sazzini M, De Fanti S, Rondinelli M, Farnetti E, Casali B, Caretto A, Novara F, Zuffardi O. Three reportedly unrelated families with liddle syndrome inherited from a common ancestor. *Hypertension* 2018;71: 273–279.
 - 24. Abbass A, D'Souza J, Khalid S, et al. Liddle's syndrome in Association with Aortic Dissection. *Cureus.* 2017 4:9(5)
 - 25. Findling JW, Raff H, Hansson JH, Lifton RP. Liddle's syndrome: prospective genetic screening and suppressed aldosterone secretion in an extended kindred. *J Clin Endocrinol Metab.* 1997;82(4):1071
 - 26. Büyükkaragöz B, Yılmaz A, Karcaaltıncaba D, Ozdemir O, Ludwig M. Liddle syndrome in a Turkish family with heterogeneous phenotypes. *Pediatr Int* 2016 Aug;58(8):801-4
 - 27. Botero-Velez M, Curtis JJ, Warnock DG. Liddle's syndrome revisited- a disorder of sodium re-absorption in the distal tubule. *N Engl J Med.* 1994;330(3):178
 - 28. Bogdanovic R, Kuburovic V, Stajic N, Mughal SS, Hilger A, Ninic S, Prijic S, Ludwig M. Liddle syndrome in a Serbian family and literature review of underlying mutations. *Eur. J. Pediatr.* 2012, 171:471–478.
 - 29. Yamashida Y, Koga M, Takeda Y et al. Two sporadic cases of Liddle's syndrome caused by De novo ENaC mutations. *Am J Kidney Dis.* 2011;37(3):499
 - 30. Yang KQ, Lu, CX, Fan P, Zhang Y, Meng X, Dong XQ, Luo F, Liu YX, Zhang HM, Wu HY. Genetic screening of SCNN1B and SCNN1G genes in early-onset hypertensive patients helps to identify Liddle syndrome. *Clin. Exp. Hypertens.* 2018, 40:107–111.
 - 31. Warnock, D.G. Liddle syndrome: An autosomal dominant form of human hypertension. *Kidney Int.* 1998;53:18–24
 - 32. Cui Y, Tong A, Jiang J, et al. Liddle Syndrome: clinical and genetic. *J Clin Hypertens* 2017 May;19(5):524-529
 - 33. Caretto A, Primerano L, Novara F, Zuffardi O, Genovese S, Rondinelli M. A therapeutic challenge: Liddle's syndrome managed with amiloride during pregnancy. *Case Rep. Obstet. Gynecol.* 2014, 2014:156250
 - 34. Awadalla M, Patwardhan M, Alsamsam A, Imran N. Management of Liddle Syndrome in Pregnancy: A Case Report and Literature Review. *Case rep obstet Gynecol* 2017;2017:6279460.