

Bölüm 14

KAFA İÇİ BASINÇ DEĞİŞİKLİKLERİİNDE GÜNCEL YAKLAŞIMLAR

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GİRİŞ

Kafa içi basınç değişikliklerine bağlı gelişen nörolojik hastalıklar, ciddi, hayatı tehdit eden komplikasyonlar ile sonuçlanabildiğinden erken tanınması ve tedavi edilmesi gereken durumlardır. Kafa içi basınç artışı ve azalması şeklinde iki ana gruba ayırmakla birlikte, her iki durumun da en sık başvuru şikayetleri baş ağrısıdır. Baş ağrısına sebep olabilen primer ve sekonder pek çok nörolojik hastalık olabildiğinden, bu tanılara yönelebilme için hastanın öyküsündeki bazı ayrıntılara, klinik muayene bulgularına, normal intrakranial basıncı oluşturan fizyolojik yapılar ile bu basıncı artıran veya azaltan patolojilerin bilinmesine ihtiyaç vardır. Bu bölümde normal kafa içi basıncı oluşturan temel yapılar ile bu basıncın artmasına ya da azalmasına neden olan patolojilerden bahsedilecek ve güncel yaklaşımlar gözden geçirilecektir.

NORMAL İNTRAKRANİYAL BASINÇ

İntrakranial boşluk kemikler ile tamamen çevrili olması nedeniyle oldukça rijittir. Bu boşluğun iç hacmi 1400-1700 ml arasındadır. Normal intrakranial basıncının oluşması için fizyolojik koşullarda bu hacmin %80'ini beyin parankimi (ortalama beyin parankimi hacmi 1200-1400 ml), %10'unu beyin omurilik sıvısı (BOS) (ortalama BOS hacmi 104 ml), kalan %10'unu da kan (ortalama kan hacmi 150 ml) doldurmaktadır. İntrakranial alanın hacmi değişimeyeceğinden, bu bileşenlerin birinde artış olması diğerin azalması ile dengelenir. Bu ilişki Monro-Kellie Doktrini olarak bilinir. Ayrıca kafa içerisinde yerleşebilen abseler, kitlesel oluşumlar, hematomlar gibi patolojik durumları kompanse etmek için öncelikle BOS ve kan hacminde azalma olur ancak uzaklaştırılacak daha fazla BOS ve kan hacmi kalmadığında intrakranial basınç (İKB) artışı gelişebilir.¹

İntrakranial basınç ölçümü dört anatomik bölge kullanılarak yapılabilir: Lateral ventrikülerin içinden (intraventriküler), beyin parankiminden (intra-

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KAYNAKLAR

1. Smith ER, Amin-Hanahni S. Evaluation and management of elevated pressure in adults, Up-to-date, (2020). (20/07/2020 tarihinde <https://www.uptodate.com/contents/evaluation-and-management-of-elevated-intracranial-pressure-in-adults> adresinden ulaşılmıştır)
2. Brain Trauma Foundation, American Association of Neurological Surgeons, Congress of Neurological Surgeons, et al. Guidelines for the management of severe traumatic brain injury. VII. Intracranial pressure monitoring technology. *J Neurotrauma* 2007; 24 Suppl 1:S45.).
3. Kristiansson H, Nissborg E, Bartek J Jr, et al. Measuring elevated intracranial pressure through noninvasive methods: a review of the literature. *J Neurosurg Anesthesiol* 2013; 25:372.
4. Castillo LR, Robertson CS. Management of intracranial hypertension. *Crit Care Clin.* 2007;22:713-32
5. Bothwell SW, Janigro D, Patabendige A. Cerebrospinal fluid dynamics and intracranial pressure elevation in neurological diseases *Fluids and Barriers of the CNS* 2019 Apr 10;16(1):9.
6. Tumani H, Huss A, Bachhuber F. The cerebrospinal fluid and barriers - anatomic and physiologic considerations. *Handb Clin Neurol.* 2017;146:21-32.
7. Lee SC, Lueck CJ. Cerebrospinal fluid pressure in adults. *J Neuroophthalmol.* 2014;34(3):278-283. doi:10.1097/WNO.0000000000000155
8. Strandgaard S, Paulson OB. Cerebral blood flow and its pathophysiology in hypertension. *Am J Hypertens* 1989; 2:486
9. Lee AG, Wall M. Idiopathic intracranial hypertension (pseudotumor cerebri): Clinical features and diagnosis, Uptodate, (2020). (20/07/2020 tarihinde <https://www.uptodate.com/contents/idiopathic-intracranial-hypertension-pseudotumor-cerebri-clinical-features-and-diagnosis> adresinden ulaşılmıştır).
10. Pinto VL, Tadi P, Adeyinka A. Increased Intracranial Pressure. In: StatPearls. Treasure Island (FL): StatPearls Publishing; March 25, 2020.
11. Plum F, Posner J. The Diagnosis of Stupor and Coma, 3rd ed, FA Davis, Philadelphia 1980.
12. Carmelo A, Ficola A, Fravolini ML, et al. ICP and CBF Regulation: A new Hypothesis to Explain the “Windkessel” Phenomenon *Acta Neurochir* (2002) [Suppl] 81: 113-116
13. Kiriş T, Baykan B (2011). Kafa İçi Basınç Değişiklikleri. Öge AE, Baykan B (Ed.). Nöroloji (İkin-ci Baskı) İçinden (211-225). İstanbul: Nobel Tip Kitapları.
14. Weil RJ, Oldfied HE. Cerebral Edema, Clinicalgate, (2015). (21/07/2020 tarihinde <https://clinicalgate.com/cerebral-edema/> adresinden ulaşılmıştır).
15. Al-Okaili RN, Krejza J, Wang S, et al. Advanced MR imaging techniques in the diagnosis of intraaxial brain tumors in adults. *Radiographics.* 2006;26(suppl 1):S173-S189.
16. Srinivasan A, Goyal M, Al Azri F, et al. State of the art imaging of acute stroke. *Radiographics.* 2006;26(suppl 1):S75-S95.
17. Nehring SM, Tadi P, Tenny S. Cerebral Edema. [Updated 2020 Jun 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537272>
18. Koenig MA. Cerebral Edema and Elevated Intracranial Pressure. *Continuum (Minneapolis Minn).* 2018;24(6):1588-1602. doi:10.1212/CON.000000000000665
19. Jourdan C, Convert J, Mottelese C, et al. [Evaluation of the clinical benefit of decompression hemicraniectomy in intracranial hypertension not controlled by medical treatment]. *Neurochirurgie* 1993; 39:304.
20. Jaeger M, Soehle M, Meixensberger J. Effects of decompressive craniectomy on brain tissue oxygen in patients with intracranial hypertension. *J Neurol Neurosurg Psychiatry* 2003; 74:513.
21. Diedler J, Sykora M, Blatow M, et al. Decompressive surgery for severe brain edema. *J Intensive Care Med* 2009; 24:168.
22. Bioussé V, Bruce BB, Newman NJ. Update on the pathophysiology and management of idiopathic intracranial hypertension. *J Neurol Neurosurg Psychiatry*. 2012 May;83(5):488-94
23. Ko MW, Liu GT. Idiopathic intracranial hypertension. *Horm Res Paediatr* 2011; 74:381–9.

24. Friedman DI, Quiros PA, Subramanian PS, et al. Headache in Idiopathic Intracranial Hypertension: Findings From The Idiopathic Intracranial Hypertension Treatment Trial. *Headache* 2017;57 (8):1195-205.
25. Wall M, Kupersmith MJ, Kieburtz KD , et al. The idiopathic intracranial hypertension treatment trial: clinical profile at baseline. *JAMA Neurol*. 2014 Jun;71(6):693-701.
26. Chen J, Wall M. Epidemiology and risk factors for idiopathic intracranial hypertension. *Int Ophthalmol Clin* 2014;54(1):1-11.
27. Bidot S, Bruce BB, Saindane AM, et al. Asymmetric papilledema in idiopathic intracranial hypertension. *J Neuroophthalmol* 2015;35(1):31-6.
28. Celebisoy N, Seçil Y, Akyurekli O. Pseudotumor cerebri: etiological factors, presenting features and prognosis in the western part of Turkey. *Acta Neurol Scand* 2002;106:367-70.
29. Bhandohal JS, Mirza T. Blind overnight: A case of fulminant idiopathic intracranial hypertension. *Am J Emerg Med* 2017;35(10): 1581.e1-1581.e2.
30. Chari C, Rao NS. Benign intracranial hypertension its unusual manifestations. *Headache* 1991;31(9):599-600.
31. Rudnick E, Sismanis A. Pulsatile tinnitus and spontaneous cerebrospinal fluid rhinorrhea: indicators of benign intracranial hypertension syndrome. *Otol Neurotol*. 2005;26(2):166.
32. Dandy WE. Intracranial Pressure Without Brain Tumor: Diagnosis and Treatment. *Ann Surg* 1937;06(4):492-513.
33. Friedman DI, Liu G, Digre KB. Diagnostic criteria for the pseudotumor cerebri syndrome in adults and children. *Neurology* 2013;81(13):1159–65.
34. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. *Cephalgia* 2018;38 (1):1-211.
35. Rohr A, Dorner L, Stengele R, et al. Reversibility of venous sinus obstruction in idiopathic intracranial hypertension. *AJNR Am J Neuroradiol* 2007;28:656-9.
36. Sylaja PN, Ahsan Moosa NV, Radhakrishnan K, et al. Differential diagnosis of patients with intracranial sinus venous thrombosis related isolated intracranial hypertension from those with idiopathic intracranial hypertension. *J Neurol Sci* 2003;215(1-2):9-12.
37. Bassi ST, Mohana KP. Optical coherence tomography in papilledema and pseudopapilledema with and without optic nerve head drusen. *Indian J Ophthalmol*. 2014;62(12):1146-1151.
38. Aylward SC. Pediatric idiopathic intracranial hypertension: a need for clarification. *Pediatr Neurol*. 2013;49(5):303-4.
39. Handley JD, Baruah BP, Williams DM, et al. Bariatric surgery as a treatment for idiopathic intracranial hypertension: a systematic review. *Surg Obes Relat Dis* 2015;11(6):1396-403.
40. Matthews YY. Drugs used in childhood idiopathic or benign intracranial hypertension. *Arch Dis Child Educ Pract Ed*. 2008;93(1):19.
41. Johnson CA, Cello KE, Zamba KD, et al. Idiopathic Intracranial Hypertension Study Group. Visual Field Outcomes for the Idiopathic Intracranial Hypertension Treatment Trial (IIHTT). *Invest Ophthalmol Vis Sci* 2016;57(3):805- 12.
42. Celebisoy N, Gökcay F, Sirin H, et al. Treatment of idiopathic intracranial hypertension: topiramate vs acetazolamide, an open-label study. *Acta Neurol Scand* 2007;116(5): 322-7.
43. Carta F, Supuran CT. Diuretics with carbonic anhydrase inhibitory action: a patent and literature review (2005 - 2013). *Expert Opin Ther Pat*. 2013;23(6):681-91.
44. Förderreuther S, Straube A. Indometacin reduces CSF pressure in intracranial hypertension. *Neurology* 2000;55:1043-5.
45. Neyal M, Neyal A. Kafaçi Basınç Değişikliklerine Bağlı Baş Ağrıları. Selçuki D, editör. Baş AğrıSİ Özel Sayısı. 1.Baskı. Ankara: Türkiye Klinikleri; 2018.p.74-83.
46. McGirt MJ, Woodworth G, Thomas G, et al. Cerebrospinal fluid shunt placement for pseudotumor cerebri-associated intractable headache: predictors of treatment response and an analysis of long-term outcomes. *J Neurosurg* 2004; 101:627-32.
47. Feldon SE. Visual outcomes comparing surgical techniques for management of severe idiopathic intracranial hypertension. *Neurosurg Focus* 2007;23:E6.

48. Banta JT, Farris BK. Pseudotumor cerebri and optic nerve sheath decompression. *Ophthalmology* 2000;107:1907-12.
49. Sencer A, Akcakaya MO, Basaran B, et al. Unilateral endoscopic optic nerve decompression for idiopathic intracranial hypertension: a series of 10 patients. *World Neurosurg* 2014;82:745-50.
50. Ahmed RM, Wilkinson M, Parker GD, et al. Transverse sinus stenting for idiopathic intracranial hypertension: a review of 52 patients and of model predictions. *AJNR Am J Neuroradiol* 2011;32:1408-14.
51. Kumpe DA, Bennett JL, Seinfeld J, et al. Dural sinus stent placement for idiopathic intracranial hypertension. *J Neurosurg* 2012;116:538-48.
52. Wall M. Update on Idiopathic Intracranial Hypertension. *Neurol Clin* 2017;35(1):45-57.
53. Taktakishvili O, Shah VA, Shahbaz R, et al. Recurrent idiopathic intracranial hypertension. *Ophthalmology*. 2008;115(1):221.doi:10.1016/j.ophtha.2007.06.041.
54. Ko MW, Chang SC, Ridha MA, et al. Weight gain and recurrence in idiopathic intracranial hypertension: a case-control study. *Neurology* 2011;76(18): 1564-7.
55. Schievink WI. Spontaneous spinal cerebrospinal fluid leaks and intracranial hypotension. *JAMA* 2006;295:2286-96.
56. Raskin NH. Lumbar puncture headache: a review. *Headache* 1990; 30:197.
57. Mokri B. Spontaneous cerebrospinal fluid leaks: from intracranial hypotension to cerebrospinal fluid hypovolemia evolution of a concept. *Mayo Clin Proc* 1999; 74:1113.
58. Habibi Z, Nejat F, El Khashab M. Possible causes of seizure after spine surgery. *J Pediatr Neurosci*. 2010; 5(1): 36-8.
59. Farhat HI, Hood B, Vanni S, et al. Minimally invasive repair of spontaneous intracranial hypotension. *J Neurosurg*. 2011;114(2):505-9. doi:10.3171/2010.8.JNS10412.
60. Davidson B, Nassiri F, Mansouri A, et al. Spontaneous Intracranial Hypotension: A Review and Introduction of an Algorithm For Management. *World Neurosurg* 2017;101:343-9.
61. Mokri B, Maher CO, Sencakova D. Spontaneous CSF leaks: underlying disorder of connective tissue. *Neurology* 2002; 58:814-16
62. Ferrante E, Citterio A, Savino A, et al. Postural headache in a patient with Marfan's syndrome. *Cephalgia* 2003; 23:552-5.
63. Schrijver I, Schievink WI, Godfrey M, et al. Spontaneous spinal cerebrospinal fluid leaks and minor skeletal features of Marfan syndrome: a microfibrillopathy. *J Neurosurg* 2002; 96:483-9.
64. Grimaldi D, Mea E, Chiapparini L, et al. Spontaneous low cerebrospinal pressure: a mini review. *Neurol Sci* 2004; 25 Suppl 3:S135
65. Lay CL, Campbell JK, Mokri B. Low cerebrospinal fluid pressure headache. In: Headache, Goadsby PJ , Silberstein SD (Eds), Butterworth-Heinemann, Boston 1997. p.355
66. Lasater GM. Primary intracranial hypotension. The low spinal fluid pressure syndrome. *Headache* 1970; 10:63
67. Schievink WI, Schwartz MS, Maya MM, et al. Lack of causal association between spontaneous intracranial hypotension and cranial cerebrospinal fluid leaks. *J Neurosurg* 2012; 116:749-54.
68. Franzini A, Messina G, Nazzi V, et al. Spontaneous intracranial hypotension syndrome: a novel speculative physiopathological hypothesis and a novel patch method in a series of 28 consecutive patients. *J Neurosurg* 2010; 112:300-6.
69. Kumar N, Diehn FE, Carr CM, et al. Spinal CSF venous fistula: A treatable etiology for CSF leaks in craniospinal hypovolemia. *Neurology* 2016; 86:2310-2
70. Mokri B. Spontaneous low pressure, low CSF volume headaches: spontaneous CSF leaks. *Headache* 2013; 53:1034-53.
71. Pattichis AA, Slee M. CSF hypotension: A review of its manifestations, investigation and management. *J Clin Neurosci* 2016;34:39-43.
72. Watanabe A, Horikoshi T, Uchida M. Diagnostic value of spinal MR imaging in spontaneous intracranial hypotension syndrome. *AJNR Am J Neuroradiol*. 2009 Jan;30(1):147-51.
73. Öcek Ö, Öcek L. A Patient with Bilateral Subdural Hematoma due to Spontaneous Intracranial Hypotension. *Turk J Neurol*. 2019; 25(4): 243-5.

74. Mokri B. Radioisotope cisternography in spontaneous CSF leaks: interpretations and misinterpretations. Headache. 2014 Sep;54(8):1358-8.
75. Schievink WI. Novel neuroimaging modalities in the evaluation of spontaneous cerebrospinal fluid leaks. Curr Neurol Neurosci Rep. 2013 Jul;13(7):358.
76. Kranz PG, Tanpitukpongse TP, Choudhury KR, et al. How common is normal cerebrospinal fluid pressure in spontaneous intracranial hypotension? Cephalgia. 2016;36(13):1209-17. doi:10.1177/0333102415623071.
77. Hoffmann J. Impaired cerebrospinal fluid pressure. Handb Clin Neurol. 2017;146:171-85.
78. Takahashi K, Mima T, Akiba Y. Chronic Subdural Hematoma Associated with Spontaneous Intracranial Hypotension: Therapeutic Strategies and Outcomes of 55 Cases. Neurol Med Chir (Tokyo) 2016;56(2):69-76.