

BÖLÜM 4



ÇOCUKLARDA VE GENÇLERDE İSKEMİK İNME

Enes BOZKURT¹

GİRİŞ

İnme, beyne giden kan akımının herhangi bir nedenle bozulması sonucu o bölgedeki nöronların hipoksiden zarar görmesi ve bu zararın 24 saatten uzun sürmesi olarak tanımlanır. Çocukluk çağında inme erişkinlere kıyasla nadir görülmektedir. Nadir olmasının yanı sıra aşına olunmaması, teşhisin gecikmesine ve yanlış teşhise neden olur. Bugüne kadar, pediatrik popülasyonda akut inme yönetimi konusunda sınırlı sayıda randomize klinik çalışma bulunmaktadır. Pediatrik inmeye yönelik yaklaşım, yetişkin nüfusla ilgili verilerden ve deneyimlerden çıkarılmıştır. Erişkinlerdeki inmelerin yaklaşık %15'i hemorajik olmasına karşın, çocuklarda inmelerin yarısı hemorajik, yarısı iskemiktir (1-2). İnmenin erken tanınması ve etiyolojik sebebin belirlenmesi inmenin tekrarlama riskini azaltmaktadır. Günümüzde yeni tanısal yöntemlerin gelişmesi, hastaneye ulaşım ve sevk zincirlerinin daha başarılı olması sebebiyle bu konuda ilerleme sağlanmıştır.

EPİDEMİYOLOJİ

Çocuklarda İnme İnsidansı yenidoğanlarda 10.2/100.000, çocuklukta yılda 1-2/100.000 dir (3). Perinatal dönem, 5 yaş altı ve ergenlikte en yüksek insidansa sahip olduğu dönemdir. Çocukluk çağı inmeleri, anne ve fetüsün benzersiz patogenezi nedeniyle 29 günlükten önceki inme olarak tanımlanan perinatal inmeden ayrılır ve çocukluk çağı inme terimi 29 gün-18 yaş arasını kapsamaktadır

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KAYNAKLAR

1. Earley CJ, Kittner SJ, Feeser BR, et al. Stroke in children and sickle-cell disease: Baltimore-Washington cooperative young stroke study. *Neurology*. 1998;51(1):169–176.
2. Carvalho KS, Garg BP. Arterial strokes in children. *Neurologic Clinics*. 2002;20(4):1079–1100.
3. deVeber GA, Kirton A, Booth FA et al (2017) Epidemiology and outcomes of arterial ischemic stroke in children: the Canadian Pediatric Ischemic Stroke Registry. *Pediatr Neurol* 69:58–70
4. Chiang KL, Cheng CY (2018). Epidemiology, risk factors and characteristics of pediatric stroke: a nationwide population-based study. *QJM*, 111:445-454
5. Ferriero HJ, Fullerton et al (2019) Management of stroke in neonates and children a scientific statement from the American Heart Association/American Stroke Association. on behalf of the American Heart Association Stroke Council and Council on Cardiovascular and Stroke Nursing. *Stroke* 50:e00–e00
6. Mallick A, Ganesan V, Kirkham FJ et al (2014) Childhood arterial ischaemic stroke incidence, presenting features, and risk factors: a prospective population-based study. *Lancet Neurol* 13:35
7. Felling RJ, Rafay MF, Bernard TJ et al (2020) Predicting recovery and outcome after pediatric stroke: results from the international pediatric stroke study. *Ann Neurol* 87(6):840–852
8. Dunbar M, Kirton A (2018) Perinatal stroke: mechanisms, management, and outcomes of early cerebrovascular brain injury. *Lancet Child Adolesc Health* 2(9):666–676
9. Gerstl L, Weinberger R, Heinen F et al (2019) Arterial ischemic stroke in infants, children, and adolescents: results of a Germany-wide surveillance study 2015–2017. *J Neurol* 266(12):2929–2941
10. Rafay MF, Pontigon AM, Chiang J, Adams M, Jarvis DA, Silver F, et al. (2009). Delay to diagnosis in acute pediatric arterial ischemic stroke. *Stroke*, 40:58-64
11. Williamson C, Morgan L, Klein JP (2017). Imaging in Neurocritical Care Practice. *Semin Respir Crit Care Med*, 38:840-852
12. Mackay MT, Slavova N, Pastore-Wapp M, Grunt S, Stojanovski B, Donath S, Steinlin M (2020). Pediatric ASPECTS predicts outcomes following acute symptomatic neonatal arterial stroke. *Neurology*, 94:e1259-e1270.
13. Mackay MT, Chua ZK, Lee M et al (2014) Stroke and nonstroke brain attacks in children. *Neurology* 82:1434–1440
14. Rafay MF, Pontigon AM, Chiang J et al (2009) Delay to diagnosis in acute pediatric arterial ischemic stroke. *Stroke* 40(1):58–64
15. Srinivasan J, Miller SP, Phan TG, Mackay MT (2009) Delayed recognition of initial stroke in children: need for increased awareness. *Pediatrics* 124(2):e227–e234
16. Zucconi G, Fitz C, Greene S, Cummings DD et al (2018) Imaging review of common and rare causes of stroke in children. *Top Magn Reson Imaging* 27(6):463–477
17. Zhang X, Li C, Li Q (2016) Magnetic resonance imaging in pediatric sickle cell anemia. *Exp Ther Med* 12(2):555–558
18. Sen S, Oppenheimer S. Bedside assessment of stroke and stroke mimics. *Annals of Indian Academy of Neurology*. 2008;11(5):S4–S11.
19. Carvalho KS, Garg BP. Arterial strokes in children. *Neurologic Clinics*. 2002;20(4):1079–
20. DeVeber G, Roach ES, Riela AR, Wiznitzer M. Stroke in children: recognition, treatment, and future directions. *Seminars in Pediatric Neurology*. 2000;7(4):309–317.
21. Ganesan V, Prengler M, McShane MA, Wade AM, Kirkham FJ. Investigation of risk factors in children with arterial ischemic stroke. *Annals of Neurology*. 2003;53(2):167–173.
22. Gerstl L, Weinberger R, von Kries R et al (2018) Risk factors in childhood arterial ischaemic stroke: findings from a population-based study in Germany. *Eur J Paediatr Neurol* 22(3):380–386
23. Kimberly Atianzar, Peter Casterella, Ming Zhang, Sameer Gafoor (2017). Update on the Ma-

nagement of Patent Foramen Ovale in 2017: Indication for Closure and Literature Review. *US Cardiology Review*, 11:75-9.

24. Ohene-Frempong K, Weiner SJ, Sleeper LA, Miller ST, Embury S, Moohr JW, et al. (1998). Cerebrovascular accidents in sickle cell disease: rates and risk factors. *Blood*, 91:288-94.
25. Ganesan V, Prengler M, McShane MA, Wade AM, Kirkham FJ. Investigation of risk factors in children with arterial ischemic stroke. *Annals of Neurology*. 2003;53(2):167-173.
26. Nestoridi E, Buonanno FS, Jones RM, et al. Arterial ischemic stroke in childhood: the role of plasma-phase risk factors. *Current Opinion in Neurology*. 2002;15(2):139-144.
27. Schlegel N. Thromboembolic risks and complications in nephrotic children. *Seminars in Thrombosis and Hemostasis*.
28. Gruppo R, DeGrauw A, Fogelson H, Glauser T, Balasa V, Gartside P. Protein C deficiency related to valproic acid therapy: a possible association with childhood stroke. *Journal of Pediatrics*. 2000;137(5):714-718.
29. Maguire JL, Deveber G, Parkin PC. Association between iron-deficiency anemia and stroke in young children. *Pediatrics*. 2007;120(5):1053-1057.
30. Askalan R, Laughlin S, Mayank S, et al. Chickenpox and stroke in childhood: a study of frequency and causation. *Stroke*. 2001;32(6):1257-1262.
31. Tsze DS, Valente JH (2011). Pediatric stroke: a review. *Emerg Med Int*, 2011:734506
32. Moriarty DM, Haller JO, Loh JP, Fikrig S. Cerebral infarction in pediatric acquired immunodeficiency syndrome. *Pediatric Radiology*. 1994;24(8):611-612.
33. Hutchison JS, Ichord R, Guerguerian AM, DeVeber G. Cerebrovascular disorders. *Seminars in Pediatric Neurology*. 2004;11(2):139-146.
34. Salih MAM, Abdel-Gader AGM, Al-Jarallah AA, et al. Infectious and inflammatory disorders of the circulatory system as risk factors for stroke in Saudi children. *Saudi Medical Journal*. 2006;27(supplement 1):S41-S52.
35. Carlin TM, Chanmugam A. Stroke in children. *Emergency Medicine Clinics of North America*. 2002;20(3):671-685.
36. Eeg-Olofsson O, Ringheim Y. Stroke in children. Clinical characteristics and prognosis. *Acta Paediatrica Scandinavica*. 1983;72(3):391-395.
37. Kirkham FJ. Stroke in childhood. *Archives of Disease in Childhood*. 1999;81(1):85-89.
38. Wityk RJ, Zanferrari C, Oppenheimer S. Neurovascular complications of Marfan syndrome: a retrospective, hospital-based study. *Stroke*. 2002;33(3):680-684.
39. Pavlakis SG, Kingsley PB, Bialer MG. Stroke in children: genetic and metabolic issues. *Journal of Child Neurology*. 2000;15(5):308-315.
40. Kelly PJ, Furie KL, Kistler JP, et al. Stroke in young patients with hyperhomocysteinemia due to cystathionine beta-synthase deficiency. *Neurology*. 2003;60(2):275-279.
41. Schoenberg BS, Mellinger JF, Schoenberg DG. Cerebrovascular disease in infants and children: a study of incidence, clinical features, and survival. *Neurology*. 1978;28(8):763-768.
42. Grotta J. Cerebrovascular disease in young patients. *Thrombosis and Haemostasis*. 1997;78(1):13-23.
43. Lopez-Yunez A, Garg B. Noninfectious cerebral vasculitis in children. *Seminars in Cerebrovascular Disease and Stroke*. 2001;1(3):249-263.
44. Uszynski M, Osinska M, Zekanowska E, Ziolkowska E. Children with acute lymphoblastic leukemia: is there any subgroup of children without elevated thrombin generation? A preliminary study utilizing measurements of thrombin-antithrombin III complexes. *Medical Science Monitor*. 2000;6(1):108-111.
45. Nowak-Göttl U, Heinecke A, von Kries R, Nürnberger W, Münchow N, Junker R. Thrombotic events revisited in children with acute lymphoblastic leukemia—impact of concomitant *Escherichia coli* asparaginase/prednisone administration. *Thrombosis Research*. 2001;103(3):165-172.

46. Peñagaricano JA, Linskey ME, Ratanatharathorn V. Accelerated cerebral vasculopathy after radiation therapy to the brain. *Neurology India*. 2004;52(4):482–486.
47. Fullerton HJ, Johnston SC, Smith WS. Arterial dissection and stroke in children. *Neurology*. 2001;57(7):1155–1160.
48. Kasner SE. Stroke treatment—specific considerations. *Neurologic Clinics*. 2000;18(2):399–417.
49. Kim SH, Kosnik E, Madden C, Rusin J, Wack D, Bartkowski H. Cerebellar infarction from a traumatic vertebral artery dissection in a child. *Pediatric Neurosurgery*. 1997;27(2):71–77.
50. Sloan MA, Kittner SJ, Feeser BR, et al. Illicit drug-associated ischemic stroke in the Baltimore-Washington young stroke study. *Neurology*. 1998;50(6):1688–1693.
51. Heijden EAWVD, Rahimtoola H, Leufkens HGM, Tijssen CC, Egberts ACG. Risk of ischemic complications related to the intensity of triptan and ergotamine use. *Neurology*. 2006;67(7):1128–1134.
52. Pacheco JT, Siepmann T, Barlinn J et al (2018) Safety and efficacy of recanalization therapy in pediatric stroke: a systematic review and meta-analysis. *Eur J Paediatr Neurol* 22(6):1035–1041
53. Bhatia K, Kortman H, Blair C et al (2019) Mechanical thrombectomy in pediatric stroke: systematic review, individual patient data meta-analysis, and case series. *J Neurosurg Pediatr*. 1–14
54. Chan AK, Hovinga CA, Gill JC et al (2015) Thrombolysis in pediatric stroke study. *Stroke* 46(3):880–885
55. Amlie-Lefond C, Shaw DWW, Cooper A et al (2020) Risk of intracranial hemorrhage following intravenous tPA (tissue-type plasminogen activator) for acute stroke is low in children. *Stroke* 51(2):542–548
56. Barry M, Hallam DK, Bernard TJ, Amlie-Lefond C (2019) What is the role of mechanical thrombectomy in childhood stroke? *Pediatr Neurol* 95:19–25
57. The National Institute of Neurological Disorders and Stroke rt-PA stroke study group. (1995). Tissue plasminogen activator for acute ischemic stroke. *N Engl J Med*. 333:1581–1587.
58. Sporns PB, Straeter R, Minnerup J et al (2020) Does device selection impact recanalization rate and neurological outcome? An analysis of the Save ChildS Study. *Stroke* 51(4):1182–1189
59. Satti S, Chen J, Sivapatham T, Jayaraman M, Orbach D (2017). Mechanical thrombectomy for pediatric acute ischemic stroke: review of the literature. *J Neurointerv Surg*. 9:732–737.
60. Roach ES, Golomb MR, Adams R, et al. Management of stroke in infants and children: a scientific statement from a special writing group of the American heart association stroke council and the council on cardiovascular disease in the young. *Stroke*. 2008;39(9):2644–2691.