Bölüm 9

MULTİPLE SKLEROZDA AYIRICI TANI

Gökçe ZEYTİN DEMİRAL[1]

GİRİŞ

Multipl skleroz (MS) tanısı, merkezi sinir sistemi (CNS)de hem zaman hem de mekanda yayılan inflamatuar demiyelinizan hasarın kanıtlarının gösterilmesine dayanmaktadır ve MS'un prevalansı giderek artmaktadır.(1,2) MS tanı kriterlerindeki yeni güncellemelere rağmen, multipl skleroz tanısındaki güçlükler devam etmektedir.(3)

MS'in ayırıcı tanısında çok sayıda nörolojik hastalık vardır. MS olarak yanlış tanı konulan en sık bozukluğun tek başına veya diğer tanılarla birlikte migren olarak değerlendirildiği ve yanlış tanı konulan hastaların %22'sinin migren olduğu bildirilmiş.(4) MS ile karışan başlıca tanılar; Migren, fibromiyalji ve psikiyatrik durumlardır.(4–8)

Merkezi sinir sisteminin (CNS) inflamatuar demiyelinizan hastalıkları; nöromiyelitis optika spektrum bozuklukları (NMOSD), akut dissemine ensefalo miyelit (ADEM) ve bu gruptaki diğer bazı nadir hastalıklar, ergenlik veya yetişkinlik dönemlerinde başlayan çeşitli kalıtsal bozukluklar ve bazıları esas olarak genç erişkin popülasyonu etkileyen enfeksiyöz, neoplastik veya vasküler bozukluklardan oluşmaktadır.(7,8)

NÖROMİYELİTİS OPTİKA SPEKTRUM BOZUKLUKLARI

Klinik olarak Nöromiyelitis Optika (NMO) ilk olarak 1894 yılında Eugène Devic ve Fernand Gault tarafından tanımlanmıştır.(9) Yüzyıldan fazla bir süredir, nöromiyelitis optika veya Devic hastalığı, multipl sklerozun varyantı olarak kabul edilmiştir.(10) 2004'te aquaporin-4'e (AQP4) karşılık gelen antikorun keşfi, nörolojide ve otoimmün hastalıkları anlamada büyük bir atılım olmuştur.(11)

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kendini gösteren karmaşık bir nörolojik bozukluktur. Bu semptomlar bazen görme bozuklukları veya parestezideن oluşur.(131)

Migrendeki supratentoryal lezyonlar, periventrikülerden ziyade çoğunlukla subkortikaldir ve jukstakortikal olma olasılıkları daha düşüktür ve son zamanlarda MS lezyonlarında görülmesi beklenen santral ven işaretin(CVS)'den yoksun oldukları gösterilmiştir.(132)

KAYNAKLAR

1. Browne P, Chandraratna D, Angood C et al. Atlas of Multiple Sclerosis 2013: A growing global problem with widespread inequity. Neurology. 2014 Sep 9;83(11):1022–4.
2. Koch-Henriksen N, Sørensen PS. The changing demographic pattern of multiple sclerosis epidemiology. Vol. 9, The Lancet Neurology. 2010. p. 520–32.
3. Solomon AJ, Pettigrew R, Naismith RT, et al. Challenges in multiple sclerosis diagnosis: Misunderstanding and misapplication of the McDonald criteria. Multiple Sclerosis Journal. 2021 Feb 12;27(2):250–8.
4. Solomon AJ, Bourdette DN, Cross AH, et al. The contemporary spectrum of multiple sclerosis misdiagnosis. Neurology. 2016 Sep 27;87(13):1393–9.
5. Toledano M, Weinshenker BG, Solomon AJ. A Clinical Approach to the Differential Diagnosis of Multiple Sclerosis. Current Neurology and Neuroscience Reports. 2015 Aug 26;15(8):57.
6. Murray TJ, Murrayt SJ. Characteristics of patients found not to have multiple sclerosis.
7. Rolak LA, Fleming JO. The Differential Diagnosis of Multiple Sclerosis. The Neurologist. 2007 Mar;13(2):57–72.
8. Miller D, Weinshenker B, Filippi M, et al. Differential diagnosis of suspected multiple sclerosis: a consensus approach. Multiple Sclerosis Journal. 2008 Nov 19;14(9):1157–74.
9. Devic E. Myélite subaiguë compliquée de névrite optique. . Le Bulletin Médicale. 1894;8:1033–4.
10. Wingerchuk DM, Banwell B, Bennett JL, et al. International consensus diagnostic criteria for neuromyelitis optica spectrum disorders. Neurology. 2015 Jul 14;85(2):177–89.
11. Lennon VA, Wingerchuk DM, Kryzer TJ, et al. A serum autoantibody marker of neuromyelitis optica: distinction from multiple sclerosis. The Lancet. 2004 Dec;364(9451):2106–12.
12. Keegan M, König F, McClelland R, et al. Relation between humoral pathological changes in multiple sclerosis and response to therapeutic plasma exchange. The Lancet. 2005 Aug;366(9485):579–82.
13. Pandit L, Asgari N, Apiwattanakul M, et al. Demographic and clinical features of neuromyelitis optica: A review. Multiple Sclerosis Journal. 2015 Jun 28;21(7):845–53.
14. Flanagan EP, Cabre P, Weinshenker BG, et al. Epidemiology of aquaporin-4 autoimmunity and neuromyelitis optica spectrum. Annals of Neurology. 2016 May;79(5): 775–83.
15. Wingerchuk DM, Hogancamp WF, O'Brien PC, et al. The clinical course of neuromyelitis optica (Devic's syndrome). Neurology. 1999 Sep 1;53(5):1107–1107.

16. Cavanagh JJ, Levy M. Differential diagnosis of multiple sclerosis. La Presse Médicale. 2021 Jun;50(2):104092.
17. Wingerchuk DM, Pittock SJ, Lucchinetti CF, et al. A secondary progressive clinical course is uncommon in neuromyelitis optica. Neurology. 2007 Feb 20;68(8):603–5.
18. Sellner J, Boggild M, Clanet M, et al. EFNS guidelines on diagnosis and management of neuromyelitis optica. European Journal of Neurology. 2010 Aug;17(8):1019–32.
19. Jarius S, Ruprecht K, Wildemann B, et al. Contrasting disease patterns in seropositive and seronegative neuromyelitis optica: A multicentre study of 175 patients. Journal of Neuroinflammation. 2012 Dec 19;9(1):14.
20. Jiao Y, Fryer JP, Lennon VA, et al. Updated estimate of AQP4-IgG serostatus and disability outcome in neuromyelitis optica. Neurology. 2013 Oct 1;81(14):1197–204.
21. Papadopoulos MC, Verkman A. Aquaporin 4 and neuromyelitis optica. The Lancet Neurology. 2012 Jun;11(6):535–44.
22. Weinshenker BG, Wingerchuk DM. Neuromyelitis Spectrum Disorders. Mayo Clinic Proceedings. 2017 Apr;92(4):663–79.
23. Lucchinetti CF, Guo Y, Popescu BFGh, et al. The Pathology of an Autoimmune Astrocytopathy: Lessons Learned from Neuromyelitis Optica. Brain Pathology. 2014 Jan;24(1):83–97.
24. Guimaraães Brum D, Barreira AA, dos Santos AC, et al. HLA-DRB association in neuromyelitis optica is different from that observed in multiple sclerosis. Multiple Sclerosis Journal. 2010 Jan 7;16(1):21–9.
25. Cree BAC, Spencer CM, Varrin-Doyer M, et al. Gut microbiome analysis in neuromyelitis optica reveals overabundance of *Clostridium perfringens*. Annals of Neurology. 2016 Sep 4;80(3):443–7.
26. Varrin-Doyer M, Spencer CM, Schulze-Topphoff U, et al. Aquaporin 4-specific T cells in neuromyelitis optica exhibit a Th17 bias and recognize *Clostridium* ABC transporter. Annals of Neurology. 2012 Jul 17;72(1):53–64.
27. Chitnis T, Ness J, Krupp L, et al. Clinical features of neuromyelitis optica in children. Neurology. 2016 Jan 19;86(3):245–52.
28. Jarius S, Paul F, Franciotta D, et al. Cerebrospinal fluid findings in aquaporin-4 antibody positive neuromyelitis optica: Results from 211 lumbar punctures. Journal of the Neurological Sciences. 2011 Jul;306(1–2):82–90.
29. Bradshaw MJ, Vu N, Hunley TE, et al. Child Neurology: Neuromyelitis optica spectrum disorders. Neurology. 2017 Jan 10;88(2):e10–3.
30. McKeon A, Pittock SJ, Lennon VA. CSF complements serum for evaluating paraneoplastic antibodies and NMO-IgG. Neurology [Internet]. 2011 Mar 22 [cited 2022 Jul 22];76(12):1108–10. Available from: https://n.neurology.org/content/76/12/1108
31. Bennett J, de Seze J, Lana-Peixoto M, et al. Neuromyelitis optica and multiple sclerosis: Seeing differences through optical coherence tomography. Multiple Sclerosis Journal. 2015 May 6;21(6):678–88.
32. Brunner C, Lassmann H, Waehneldt T v., et al. Differential ultrastructural localization of myelin basic protein, myelin/oligodendroglial glycoprotein, and 2',3'-cyclic nucleotide 3'-phosphodiesterase in the CNS of adult rats. J Neurochem [Internet]. 1989 [cited 2022 Jul 22];52(1):296–304. Available from: https://pubmed.ncbi.nlm.nih.gov/2462020/

33. Linington C, Lassmann H. Antibody responses in chronic relapsing experimental allergic encephalomyelitis: correlation of serum demyelinating activity with antibody titre to the myelin/oligodendrocyte glycoprotein (MOG). Journal of Neuroimmunology. 1987 Dec;17(1):61–9.
34. Weissert R, Per Olsson T, Institutet K, et al. Myelin Oligodendrocyte Glycoprotein: Deciphering a Target in inflammatory Demyelinating Diseases. Article [Internet]. 2017;8:1. Available from: www.frontiersin.org
35. Reindl (M, Pauli F di, Berger T, Reindl M, Reindl M, Pauli F di, et al. The spectrum of MOG autoantibody-associated demyelinating diseases. NATURE REVIEWS | NEUROLOGY [Internet]. 2013;9:455–61. Available from: www.nature.com/nrneurol
36. Tenembaum S, Chitnis T, Nakashima I, et al. Neuromyelitis optica spectrum disorders in children and adolescents. 2016.
37. Denève M, Biotti D, Patsoura S, et al. MRI features of demyelinating disease associated with anti-MOG antibodies in adults. Journal of Neuroradiology. 2019 Sep;46(5):312–8.
38. de Mol C, Wong Y, van Pelt E, et al. The clinical spectrum and incidence of anti-MOG-associated acquired demyelinating syndromes in children and adults. Multiple Sclerosis Journal. 2020 Jun 16;26(7):806–14.
39. Sato DK, Callegaro D, Lana-Peixoto MA, et al. Distinction between MOG antibody-positive and AQP4 antibody-positive NMO spectrum disorders. Neurology. 2014 Feb 11;82(6):474–81.
40. van Pelt ED, Wong YYM, Ketelslegers IA, et al. Neuromyelitis optica spectrum disorders: comparison of clinical and magnetic resonance imaging characteristics of AQP4-IgG versus MOG-IgG seropositive cases in the Netherlands. European Journal of Neurology. 2016;23:580–7.
41. Hacohen Y, Absoud M, Deiva K, et al. Myelin oligodendrocyte glycoprotein antibodies are associated with a non-MS course in children. Neurology - Neuroimmunology Neuroinflammation. 2015 Apr 12;2(2):e81.
42. Hennes EM, Baumann M, Schanda K, et al. Prognostic relevance of MOG antibodies in children with an acquired demyelinating syndrome. Neurology. 2017 Aug 29;89(9):900–8.
43. Salama S, Khan M, Pardo S, et al. MOG antibody–associated encephalomyelitis/encephalitis. Multiple Sclerosis Journal. 2019 Oct 25;25(11):1427–33.
44. Baumann M, Sahin K, Lechner C, et al. Clinical and neuroradiological differences of paediatric acute disseminating encephalomyelitis with and without antibodies to the myelin oligodendrocyte glycoprotein. Journal of Neurology, Neurosurgery & Psychiatry. 2015 Mar 1;86(3):265–72.
45. Carra-Dalliere C, Menjot de Champfleur N, Ayrignac X, et al. Optic chiasm and oculomotor nerves involvement in active multiple sclerosis. Journal of Neuroradiology. 2020 Feb;47(1):62–4.
46. Ramanathan S, Prelog K, Barnes EH, et al. Radiological differentiation of optic neuritis with myelin oligodendrocyte glycoprotein antibodies, aquaporin-4 antibodies, and multiple sclerosis. Multiple Sclerosis Journal. 2016 Apr 10;22(4):470–82.
47. Kitley J, Waters P, Woodhall M, et al. Neuromyelitis Optica Spectrum Disorders With Aquaporin-4 and Myelin-Oligodendrocyte Glycoprotein Antibodies A Comparative Study. JAMA Neurol [Internet]. 2014;71(3):276–83. Available from: https://jamanetwork.com/

48. Jarius S, Paul F, Aktas O, et al. MOG encephalomyelitis: international recommendations on diagnosis and antibody testing. Available from: https://doi.org/10.1186/s12974-018-1144-2
49. Jurynczyk M, Geraldes R, Probert F, et al. Distinct brain imaging characteristics of autoantibody-mediated CNS conditions and multiple sclerosis. Available from: https://academic.oup.com/brain/article/140/3/617/2996233
50. Etemadifar M, Nasr Z, Khalili B, et al. Epidemiology of Neuromyelitis Optica in the World: A Systematic Review and Meta-Analysis. 2015; Available from: http://dx.doi.org/10.1155/2015/174720
51. Krupp LB, Banwell B, Tenembaum S. Consensus definitions proposed for pediatric multiple sclerosis and related disorders. Neurology. 2007 Apr 17;68(Issue 16, Supplement 2):S7–12.
52. Absoud M, Lim MJ, Chong WK, et al. Paediatric acquired demyelinating syndromes: incidence, clinical and magnetic resonance imaging features. Multiple Sclerosis Journal. 2013 Jan 19;19(1):76–86.
53. Torisu H, Kira R, Ishizaki Y, et al. Clinical study of childhood acute disseminated encephalomyelitis, multiple sclerosis, and acute transverse myelitis in Fukuoka Prefecture, Japan. Brain and Development. 2010 Jun;32(6):454–62.
54. Xiong C hui, Yan Y, Liao Z, et al. Epidemiological characteristics of acute disseminated encephalomyelitis in Nanchang, China: a retrospective study. BMC Public Health. 2014 Dec 4;14(1):111.
55. Boesen MS, Blinkenberg M, Koch-Henriksen N, et al. Implications of the International Paediatric Multiple Sclerosis Study Group consensus criteria for paediatric acute disseminated encephalomyelitis: a nationwide validation study. Developmental Medicine & Child Neurology. 2018 Nov;60(11):1123–31.
56. Langer-Gould A, Zhang JL, Chung J, et al. Incidence of acquired CNS demyelinating syndromes in a multiethnic cohort of children. Neurology. 2011 Sep 20;77(12):1143–8.
57. Tenembaum S, Chamoles N, Fejerman N. Acute disseminated encephalomyelitis: A long-term follow-up study of 84 pediatric patients. Neurology. 2002 Oct 22;59(8):1224–31.
58. Menge T, Hemmer B, Nessler S, et al. Acute Disseminated Encephalomyelitis An Update [Internet]. 2005. Available from: https://jamanetwork.com/
59. Hviid A, Svanström H, Scheller NM, et al. Human papillomavirus vaccination of adult women and risk of autoimmune and neurological diseases. Journal of Internal Medicine. 2018 Feb;283(2):154–65.
60. Scheller NM, Svanström H, Pasternak B, et al. Quadrivalent HPV Vaccination and Risk of Multiple Sclerosis and Other Demyelinating Diseases of the Central Nervous System. JAMA. 2015 Jan 6;313(1):54.
61. Brilot F, Dale RC, Selter RC, et al. Antibodies to native myelin oligodendrocyte glycoprotein in children with inflammatory demyelinating central nervous system disease. Annals of Neurology. 2009 Dec;66(6):833–42.
62. Mader S, Gredler V, Schanda K, et al. Complement activating antibodies to myelin oligodendrocyte glycoprotein in neuromyelitis optica and related disorders. Journal of Neuroinflammation. 2011 Dec 28;8(1):184.
63. Young NP, Weinshenker BG, Parisi JE, et al. Perivenous demyelination: association with clinically defined acute disseminated encephalomyelitis and comparison with pathologi-

cally confirmed multiple sclerosis. Brain. 2010 Feb 1;133(2):333–48.
64. Krupp LB, Tardieu M, Amato MP, et al. International Pediatric Multiple Sclerosis Study Group criteria for pediatric multiple sclerosis and immune-mediated central nervous system demyelinating disorders: revisions to the 2007 definitions. Multiple Sclerosis Journal. 2013 Sep 9;19(10):1261–7.
65. Yamaguchi Y, Torisu H, Kira R, et al. A nationwide survey of pediatric acquired demyelinating syndromes in Japan. Neurology. 2016 Nov 8;87(19):2006–15.
66. Siva A. Vasculitis of the nervous system. Journal of Neurology. 2001 Jun 1;248(6):451–68.
67. Salvarani C, Brown RD, Hunder GG. Adult primary central nervous system vasculitis. The Lancet. 2012 Aug;380(9843):767–77.
68. G. Zuccoli, N. Pipitone, A. Haldipur, et al. Imaging findings in primary central nervous system vasculitis. Clinical and Experimental Rheumatology. 2011;29:104–9.
69. Salvarani C, Brown RD, Calamia KT, et al. Primary central nervous system vasculitis: analysis of 101 patients. Annals of Neurology. 2007 Nov;62(5):442–51.
70. Levine JS, Branch DW, Rauch J. The Antiphospholipid Syndrome. New England Journal of Medicine. 2002 Mar 7;346(10):752–63.
71. MIYAKIS S, LOCKSHIN MD, ATSUMI T, et al. International consensus statement on an update of the classification criteria for definite antiphospholipid syndrome (APS). Journal of Thrombosis and Haemostasis. 2006 Feb;4(2):295–306.
72. Negrini S, Pappalardo F, Murdaca G, et al. The antiphospholipid syndrome: from pathophysiology to treatment. Clinical and Experimental Medicine. 2017 Aug 22;17(3): 257–67.
73. Rodrigues CEM, Carvalho JF, Shoenfeld Y. Neurological manifestations of antiphospholipid syndrome. European Journal of Clinical Investigation. 2010 Apr;40(4):350–9.
74. Hughes GR v. Migraine, memory loss, and "multiple sclerosis ". Neurological features of the antiphospholipid (Hughes') syndrome. Postgraduate Medical Journal. 2003 Feb 1;79(928):81–3.
75. Zhu DS, Fu J, Zhang Y, et al. Neurological antiphospholipid syndrome: Clinical, neuroimaging, and pathological characteristics. Journal of the Neurological Sciences. 2014 Nov;346(1–2):138–44.
76. Gelfand JM. Multiple sclerosis. In 2014. p. 269–90.
77. Jafri K, Patterson SL, Lanata C. Central Nervous System Manifestations of Systemic Lupus Erythematosus. Rheumatic Disease Clinics of North America. 2017 Nov;43(4):531–45.
78. Unterman A, Nolte JES, Boaz M, et al. Neuropsychiatric Syndromes in Systemic Lupus Erythematosus: A Meta-Analysis. Seminars in Arthritis and Rheumatism. 2011 Aug;41(1):1–11.
79. Hanly JG. Diagnosis and management of neuropsychiatric SLE. Nature Reviews Rheumatology. 2014 Jun 11;10(6):338–47.
80. Kovacs B. Transverse myelopathy in systemic lupus erythematosus: an analysis of 14 cases and review of the literature. Annals of the Rheumatic Diseases. 2000 Feb 1;59(2):120–4.
81. Barned S, Goodman AD, Mattson DH. Frequency of anti-nuclear antibodies in multiple sclerosis. Neurology. 1995 Feb 1;45(2):384–5.
82. Cuadrado MJ, Khamashta MA, Ballesteros A, et al. Can Neurologic Manifestations of Hughes (Antiphospholipid) Syndrome Be Distinguished from Multiple Sclerosis?: Analysis of 27 Patients and Review of the Literature. Medicine. 2000 Jan;79(1):57–68.

83. Sibbitt WL, Brooks WM, Kornfeld M, et al. Magnetic Resonance Imaging and Brain Histopathology in Neuropsychiatric Systemic Lupus Erythematosus. Seminars in Arthritis and Rheumatism. 2010 Aug;40(1):32–52.
84. Clark KEN, Clark CN, Rahman A. A critical analysis of the tools to evaluate neuropsychiatric lupus. Lupus. 2017 Apr 10;26(5):504–9.
85. Jennekens FGI. The central nervous system in systemic lupus erythematosus. Part 2. Pathogenetic mechanisms of clinical syndromes: a literature investigation. Rheumatology. 2002 Jun 1;41(6):619–30.
86. Raymond A, Zariah A, Samad S, et al. Brain calcification in patients with cerebral lupus. Lupus. 1996 Apr 2;5(2):123–8.
87. Jog NR, James JA. Biomarkers in connective tissue diseases. Journal of Allergy and Clinical Immunology. 2017 Dec;140(6):1473–83.
88. Vitali C. Classification criteria for Sjogren's syndrome: a revised version of the European criteria proposed by the American-European Consensus Group. Annals of the Rheumatic Diseases. 2002 Jun 1;61(6):554–8.
89. Pavlakis PP, Alexopoulos H, Kosmidis ML, et al. Peripheral neuropathies in Sjögren's syndrome: A critical update on clinical features and pathogenetic mechanisms. Journal of Autoimmunity. 2012 Aug;39(1–2):27–33.
90. Margaretten M. Neurologic Manifestations of Primary Sjögren Syndrome. Rheumatic Disease Clinics of North America. 2017 Nov;43(4):519–29.
91. Alexander EL, Ranzenbach MR, Kumar AJ, et al. Anti-Ro(SS-A) autoantibodies in central nervous system disease associated with Sjogren's syndrome (CNS-SS): Clinical, neuroimaging, and angiographic correlates. Neurology. 1994 May 1;44(5):899–899.
92. Delalande S, de Seze J, Fauchais AL, et al. Neurologic Manifestations in Primary Sjögren Syndrome. Medicine. 2004 Sep;83(5):280–91.
93. Manthorpe R, Manthorpe T, Sjöberg S. Magnetic Resonance Imaging of the Brain in Patients with Primary Sjögren's Syndrome. Scandinavian Journal of Rheumatology. 1992 Jan 12;21(3):148–9.
94. Massara A, Bonazza S, Castellino G, et al. Central nervous system involvement in Sjogren's syndrome: unusual, but not unremarkable--clinical, serological characteristics and outcomes in a large cohort of Italian patients. Rheumatology. 2010 Aug 1;49(8):1540–9.
95. Siva A, Saip S. The spectrum of nervous system involvement in Behçet's syndrome and its differential diagnosis. Journal of Neurology. 2009 Apr 27;256(4):513–29.
96. INTERNATIONALSTUDYGROUPFORBEHC. Criteria for diagnosis of Behcet's disease. The Lancet. 1990 May;335(8697).
97. Onder M, Gurer M. The multiple faces of Behcet's disease and its aetiological factors. Journal of the European Academy of Dermatology and Venereology. 2001 Mar;15(2):126–36.
98. Demirseren DD, Ceylan GG, Akoglu G, et al. HLA-B51 subtypes in Turkish patients with Behçet's disease and their correlation with clinical manifestations. Genetics and Molecular Research. 2014;13(3):4788–96.
99. Kalra S, Silman A, Akman-Demir G, et al. Diagnosis and management of Neuro-Behçet's disease: international consensus recommendations. Journal of Neurology. 2014 Sep 24;261(9):1662–76.
100. Al-Araji A, Kidd DP. Neuro-Behçet's disease: epidemiology, clinical characteristics, and management. The Lancet Neurology. 2009 Feb;8(2):192–204.

101. Koçer N, Islak C, Siva A, et al. CNS Involvement in Neuro-Behçet Syndrome: An MR Study. Vol. 20, AJNR Am J Neuroradiol.
102. Uygunoglu U, Saip S, Siva A. Behcet's syndrome and nervous system involvement. 2nd edition. In: Lisak RP TDCW et al, editors., editor. Vol. Chapter 28. Chichester, West Sussex, Hoboken, NJ: John Wiley & Sons, Ltd; 2016. 88–93 p.
103. Stern BJ, Aksamit A, Clifford D, et al. Neurologic Presentations of Sarcoidosis. Neurologic Clinics. 2010 Feb;28(1):185–98.
104. Terushkin V, Stern BJ, Judson MA, et al. Neurosarcoidosis. The Neurologist. 2010 Jan;16(1):2–15.
105. Wegener S, Linnebank M, Martin R, et al. Clinically Isolated Neurosarcoidosis: A Recommended Diagnostic Path. European Neurology. 2015;73(1–2):71–7.
106. Pawate S, Moses H, Sriram S. Presentations and outcomes of neurosarcoidosis: a study of 54 cases. QJM: An International Journal of Medicine. 2009 Jul;102(7):449–60.
107. Goenka N, Venna N. Teaching NeuroImages: Sarcoidosis presenting as longitudinally extensive myelitis: Excellent response to infliximab. Neurology. 2013 Aug 27;81(9):e61–e61.
108. Joseph FG, Scolding NJ. Neurosarcoidosis: a study of 30 new cases. Journal of Neurology, Neurosurgery & Psychiatry. 2009 Mar 1;80(3):297–304.
109. Huang JF, Aksamit AJ, Staff NP. MRI and PET imaging discordance in neurosarcoidosis. Neurology. 2012 Sep 4;79(10):1070–1070.
110. Coban A, Akman-Demir G, Ozsut H, et al. Multiple Sclerosis–Like Clinical and Magnetic Resonance Imaging Findings in Human Immunodeficiency Virus Positive-Case. The Neurologist. 2007 May;13(3):154–7.
111. Tan CS, Koralnik IJ. Progressive multifocal leukoencephalopathy and other disorders caused by JC virus: clinical features and pathogenesis. The Lancet Neurology. 2010 Apr;9(4):425–37.
112. Valenzuela RM, Pula JH, Garwacki D, et al. Cryptococcal meningitis in a multiple sclerosis patient taking natalizumab. Journal of the Neurological Sciences. 2014 May;340(1–2):109–11.
113. Halperin JJ. Nervous System Lyme Disease: Diagnosis and Treatment. Current Treatment Options in Neurology. 2013 Aug 12;15(4):454–64.
114. Halperin JJ. Nervous System Lyme Disease. Infectious Disease Clinics of North America. 2008 Jun;22(2):261–74.
115. Agosta F, Rocca MA, Benedetti B, et al. MR Imaging Assessment of Brain and Cervical Cord Damage in Patients with Neuroborreliosis [Internet]. Available from: www.ajnr.org
116. Agarwal R, Sze G. Neuro-Lyme Disease: MR Imaging Findings. Radiology. 2009 Oct;253(1):167–73.
117. Lukehart SA. Invasion of the Central Nervous System by Treponema pallidum: Implications for Diagnosis and Treatment. Annals of Internal Medicine. 1988 Dec 1;109(11):855.
118. Golden MR, Marra CM, Holmes KK. Update on Syphilis. JAMA. 2003 Sep 17;290(11):1510.
119. Khamaysi Z, Bergman R, Telman G, et al. Clinical and imaging findings in patients with neurosyphilis: a study of a cohort and review of the literature. International Journal of Dermatology. 2014 Jul;53(7):812–9.

120. Rubenstein J, Ferreri AJM, Pittaluga S. Primary lymphoma of the central nervous system: epidemiology, pathology and current approaches to diagnosis, prognosis and treatment. Leukemia & Lymphoma. 2008 Jan;49(sup1):43–51.
121. Scott BJ, Douglas VC, Tihan T, et al. A Systematic Approach to the Diagnosis of Suspected Central Nervous System Lymphoma. JAMA Neurology. 2013 Mar 1;70(3):311.
122. M, Ostertag CB, Seitz G, et al. Glucocorticoid therapy obscures the diagnosis of cerebral lymphoma. Acta Neuropathologica. 1990 Oct;80(6):629–34.
123. HS, Martin RJ, Simpson MA, et al. Diagnostic strategies in CADASIL. Neurology. 2002 Oct 22;59(8):1134–8.
124. H, Joutel A, Dichgans M, et al. CADASIL. The Lancet Neurology. 2009 Jul;8(7):643–53.
125. Susac JO, Egan RA, Rennebohm RM, et al. Susac's syndrome: 1975–2005 microangiopathy/autoimmune endotheliopathy. Journal of the Neurological Sciences. 2007 Jun;257(1–2):270–2.
126. Hua LH, Donlon SL, Okuda DT. A case of Susac syndrome with cervical spinal cord involvement on MRI. Journal of the Neurological Sciences. 2014 Feb;337(1–2):228–31.
127. Dörr J, Ringelstein M, Duning T, et al. Update on Susac Syndrome: New Insights in Brain and Retinal Imaging and Treatment Options. Journal of Alzheimer's Disease. 2014 Sep 2;42(s3):S99–108.
128. Wuerfel J, Sinnecker T, Ringelstein EB, et al. Lesion morphology at 7 Tesla MRI differentiates Susac syndrome from multiple sclerosis. Multiple Sclerosis Journal. 2012 Nov 18;18(11):1592–9.
129. Rennebohm R, Susac JO, Egan RA, et al. Susac's Syndrome — Update. Journal of the Neurological Sciences. 2010 Dec;299(1–2):86–91.
130. Tobin WO, Guo Y, Krecke KN, et al. Diagnostic criteria for chronic lymphocytic inflammation with pontine perivascular enhancement responsive to steroids (CLIPPERS). Brain. 2017 Sep 1;140(9):2415–25.
131. Hamedani AG, Rose KM, Peterlin BL, et al. Migraine and white matter hyperintensities: The ARIC MRI study. Neurology. 2013 Oct 8;81(15):1308–13.
132. Solomon AJ, Schindler MK, Howard DB, et al. "Central vessel sign" on 3T <scp>-FLAIR</scp> * <scp>MRI</scp> for the differentiation of multiple sclerosis from migraine. Annals of Clinical and Translational Neurology. 2016 Feb 16;3(2):82–7.