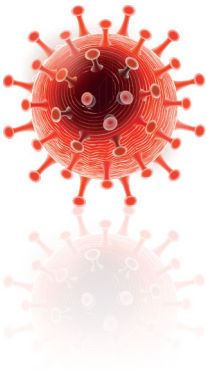

15. Bölüm

COVID-19 ve Santral Sinir Sistemi Komplikasyonları

Nazan ŞİMŞEK ERDEM[1]

1. GİRİŞ

2019 yılında tespit edilen yeni tip koronavirüsü olan Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2)'nin neden olduğu hastalık Dünya Sağlık Örgütü (DSÖ) tarafından coronavirüs hastalığı 2019 (COVID-19) olarak isimlendirildi. COVID-19, DSÖ tarafından dünyanın çoğu ülkesine yayılması ve ölümlere neden olması nedeniyle Mart 2020 tarihinde pandemi olarak ilan edildi. COVID-19, 1918 yılındaki influenza pandemisinden sonra görülen en ciddi pandemi olmuştur [1].

COVID-19'a bağlı beklenen klinik belirtiler asemptomatik olabileceği gibi septik şoka ve multiorgan yetmezliği gibi ölümlere neden olabilecek kadar ciddi de olabilmektedir. COVID-19 çoğunlukla alt solunum yolunu etkilemekle birlikte gastrointestinal, üriner, kardiyovaskuler sistemleri de etkilemektedir. SARS-CoV-2 ile enfekte olan hastalarda en sık öksürük, ateş, nefes darlığı gibi solunum yollarına ait belirtiler görüldüğü bilinmektedir. Ancak, İtalya'dan yayınlanan 103 COVID-19 hastanın yer aldığı vaka serisinde hastaların % 90'ınından fazlasında en az bir tane nörolojik semptomun da gözlendiği bildirilmiştir [2]. COVID-19 hastalığında en sık görülen nörolojik semptomlar başağrısı, baş dönmesi, tat ve koku almada bozukluk ve miyaljidir. Literatürde SARS-CoV-2'nin ciddi ve farklı nörolojik komplikasyonlara neden olduğunu bildiren çalışmalar

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COVID-19 hastalığının nadir olmayan ve ciddi bir santral sinir sistemi komplikasyonudur. COVID-19 hastalarında akut iskemik inme diğer inme hastalarına kıyasla daha şiddetli ve kötü prognozlu seyretmektedir. COVID-19 ile ilişkili potansiyel akut iskemik inmenin etiyolojisinde hiperkoagulasyon, şiddetli inflamasyon, renin-anjiyotensin-aldosteron sistemi disfonksiyonu, kardiyak disfonksiyon ve şiddetli akciger hastalıgı rol oynayabilir. Ensefalopati, COVID-19'a bağlı olan kritik hastalığı olanlarda yaygın görülen bir komplikasyondur. COVID-19 hastalarında ensefalopatinin etiyolojisi genellikle multifaktöriyeldir. COVID-19 ile ilişkili ensefelopatisi olan hastaların büyük çoğunluğunda BOS incelemesinde veya beyin görüntülemelerinde tipik beyin inflamasyonunu destekleyen bulgular görülmemiştir. COVID-19 ve ensefalopatili hastaların yönetiminde glukokortikoidlerin veya diğer immünomodülatör tedavilerin rolü belirsizdir.

Literatürde SSS sistemi tutulumu olan birkaç olgunun beyin otopsisinde veya beyin omurilik sıvısında virüsun gösterilmesi SARS-CoV-2'nin nöroinvazyanunu desteklese de SARS-CoV-2'nin doğrudan nöropatojenitesini destekleyen kesin bir kanıt henüz yoktur. Ayrıca COVID-19 ile ilişkili nörolojik belirtilerin klinik, radyolojik ve patolojik tanımlarının heterojenliği, postenfeksiyöz immun aracılı mekanizmalar, sepsis, hipoksi, koagülopati veya endotelit gibi farklı patojenik yolakların da dahil olduğunu düşündürmektedir. SARS-CoV-2'nin nöropatogenezinin tam olarak tanınması ve anlaşılması, nörolojik belirtileri olan COVID-19 hastalarının klinik yönetimini iyileştirmek için çok önemlidir.

KAYNAKÇA

1. Taubenberger, J.K. and D.M. Morens, *1918 Influenza: the mother of all pandemics.* Emerg Infect Dis, 2006. **12**(1): p. 15-22.
2. Liguori, C., et al., *Subjective neurological symptoms frequently occur in patients with SARS-CoV2 infection.* Brain Behav Immun, 2020. **88**: p. 11-16.
3. Keyhanian, K., et al., *SARS-CoV-2 and nervous system: From pathogenesis to clinical manifestation.* J Neuroimmunol, 2020. **350**: p. 577436.
4. Park, S.E., *Epidemiology, virology, and clinical features of severe acute respiratory syndrome -coronavirus-2 (SARS-CoV-2; Coronavirus Disease-19).* Clin Exp Pediatr, 2020. **63**(4): p. 119-124.
5. Astuti, I. and Ysrafil, *Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2): An overview of viral structure and host response.* Diabetes Metab Syndr, 2020. **14**(4): p. 407-412.
6. Pezzini, A. and A. Padovani, *Lifting the mask on neurological manifestations of COVID-19.* Nat Rev Neurol, 2020. **16**(11): p. 636-644.
7. Wang, F., R.M. Kream, and G.B. Stefano, *Long-Term Respiratory and Neurological Sequelae of COVID-19.* Med Sci Monit, 2020. **26**: p. e928996.
8. Bhandari, R., et al., *Divulging the Intricacies of Crosstalk Between NF-Kb and Nrf2-Keap1 Pathway in Neurological Complications of COVID-19.* 2021: p. 1-15.

9. Khatoon, F., K. Prasad, and V. Kumar, *Neurological manifestations of COVID-19: available evidences and a new paradigm*. 2020. **26**(5): p. 619-630.
10. Jose, R.J. and A. Manuel, *COVID-19 cytokine storm: the interplay between inflammation and coagulation.* Lancet Respir Med, 2020. **8**(6): p. e46-e47.
11. Nainu, F., A. Shiratsuchi, and Y. Nakanishi, *Induction of Apoptosis and Subsequent Phagocytosis of Virus-Infected Cells As an Antiviral Mechanism.* Front Immunol, 2017. **8**: p. 1220.
12. Shojaei, S. and M. Suresh, *Autophagy and SARS-CoV-2 infection: Apossible smart targeting of the autophagy pathway.* 2020. **11**(1): p. 805-810.
13. Chen, X., et al., *A systematic review of neurological symptoms and complications of COVID-19.* 2021. **268**(2): p. 392-402.
14. Maury, A., et al., *Neurological manifestations associated with SARS-CoV-2 and other coronaviruses: A narrative review for clinicians.* Rev Neurol (Paris), 2021. **177**(1-2): p. 51-64.
15. Li, Y., et al., *Acute cerebrovascular disease following COVID-19: a single center, retrospective, observational study.* 2020. **5**(3): p. 279-284.
16. Radmanesh, A. and E. Raz, *Brain Imaging Use and Findings in COVID-19: A Single Academic Center Experience in the Epicenter of Disease in the United States.* 2020. **41**(7): p. 1179-1183.
17. Yachou, Y., et al., *Neuroinvasion, neurotropic, and neuroinflammatory events of SARS-CoV-2: understanding the neurological manifestations in COVID-19 patients.* Neurol Sci, 2020. **41**(10): p. 2657-2669.
18. Bolay, H., A. Gül, and B. Baykan, *COVID-19 is a Real Headache!* Headache, 2020. **60**(7): p. 1415-1421.
19. Lechien, J.R., et al., *Clinical and epidemiological characteristics of 1420 European patients with mild-to-moderate coronavirus disease 2019.* J Intern Med, 2020. **288**(3): p. 335-344.
20. Uygun, Ö., et al., *Headache characteristics in COVID-19 pandemic-a survey study.* J Headache Pain, 2020. **21**(1): p. 121.
21. Rocha-Filho, P.A.S. and J.E. Magalhães, *Headache associated with COVID-19: Frequency, characteristics and association with anosmia and ageusia.* 2020. **40**(13): p. 1443-1451.
22. Mao, L., et al., *Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China.* JAMA Neurol, 2020. **77**(6): p. 683-690.
23. Yaghi, S., et al., *SARS-CoV-2 and Stroke in a New York Healthcare System.* Stroke, 2020. **51**(7): p. 2002-2011.
24. Hernández-Fernández, F., et al., *Cerebrovascular disease in patients with COVID-19: neuroimaging, histological and clinical description.* Brain, 2020. **143**(10): p. 3089-3103.
25. Lodigiani, C., et al., *Venous and arterial thromboembolic complications in COVID-19 patients admitted to an academic hospital in Milan, Italy.* Thromb Res, 2020. **191**: p. 9-14.
26. Hess, D.C., W. Eldahshan, and E. Rutkowski, *COVID-19-Related Stroke.* Transl Stroke Res, 2020. **11**(3): p. 322-325.
27. Tiainen, M., et al., *Body temperature, blood infection parameters, and outcome of thrombolysis-treated ischemic stroke patients.* Int J Stroke, 2013. **8**(8): p. 632-8.
28. Hsu, P.J., et al., *High Plasma D-Dimer Indicates Unfavorable Outcome of Acute Ischemic Stroke Patients Receiving Intravenous Thrombolysis.* Cerebrovasc Dis, 2016. **42**(1-2): p. 117-21.
29. Qureshi, A.I., et al., *Management of acute ischemic stroke in patients with COVID-19 infection: Insights from an international panel.* Am J Emerg Med, 2020. **38**(7): p. 1548.e5-1548.e7.
30. Wang, A., et al., *Stroke and mechanical thrombectomy in patients with COVID-19: technical observations and patient characteristics.* J Neurointerv Surg, 2020. **12**(7): p. 648-653.
31. Pop, R. and A. Hasiu, *Stroke Thrombectomy in Patients with COVID-19: Initial Experience in 13 Cases.* 2020. **41**(11): p. 2012-2016.
32. Sharma, D., et al., *Anesthetic Management of Endovascular Treatment of Acute Ischemic Stroke During COVID-19 Pandemic: Consensus Statement From Society for Neuroscience in Anesthesiology & Critical Care (SNACC): Endorsed by Society of Vascular & Interventional Neurology*

(SVIN), Society of NeuroInterventional Surgery (SNIS), Neurocritical Care Society (NCS), European Society of Minimally Invasive Neurological Therapy (ESMINT) and American Association of Neurological Surgeons (AANS) and Congress of Neurological Surgeons (CNS) Cerebrovascular Section. J Neurosurg Anesthesiol, 2020. **32**(3): p. 193-201.

33. Khosravani, H., et al., *Protected Code Stroke: Hyperacute Stroke Management During the Coronavirus Disease 2019 (COVID-19) Pandemic.* Stroke, 2020. **51**(6): p. 1891-1895.
34. Syahrul, S., H.A. Maliga, and M. Ilmawan, *Hemorrhagic and ischemic stroke in patients with coronavirus disease 2019: incidence, risk factors, and pathogenesis - a systematic review and meta-analysis.* 2021. **10**: p. 34.
35. Altschul, D.J., et al., *Hemorrhagic presentations of COVID-19: Risk factors for mortality.* Clin Neurol Neurosurg, 2020. **198**: p. 106112.
36. Beyrouti, R., et al., *Characteristics of intracerebral haemorrhage associated with COVID-19: a systematic review and pooled analysis of individual patient and aggregate data.* 2021: p. 1-11.
37. Sharifi-Razavi, A., N. Karimi, and N. Rouhani, *COVID-19 and intracerebral haemorrhage: causative or coincidental?* New Microbes New Infect, 2020. **35**: p. 100669.
38. Chen, T., et al., *Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study.* 2020. **368**: p. m1091.
39. Scullen, T., et al., *Coronavirus 2019 (COVID-19)-Associated Encephalopathies and Cerebrovascular Disease: The New Orleans Experience.* World Neurosurg, 2020. **141**: p. e437-e446.
40. Garg, R.K., V.K. Paliwal, and A. Gupta, *Encephalopathy in patients with COVID-19: A review.* J Med Virol, 2021. **93**(1): p. 206-222.
41. Wu, Y., et al., *Nervous system involvement after infection with COVID-19 and other coronaviruses.* Brain Behav Immun, 2020. **87**: p. 18-22.
42. Moriguchi, T., et al., *A first case of meningitis/encephalitis associated with SARS-Coronavirus-2.* Int J Infect Dis, 2020. **94**: p. 55-58.
43. Elkady, A. and A.A. Rabinstein, *Acute necrotizing encephalopathy and myocarditis in a young patient with COVID-19.* Neurology-Neuroimmunology Neuroinflammation, 2020. **7**(5).
44. Poyiadji, N. and G. Shahin, *COVID-19-associated Acute Hemorrhagic Necrotizing Encephalopathy: Imaging Features.* 2020. **296**(2): p. E119-e120.
45. Dixon, L., et al., *COVID-19-related acute necrotizing encephalopathy with brain stem involvement in a patient with aplastic anemia.* 2020. **7**(5).
46. Zhang, T., M.B. Rodricks, and E. Hirsh, *COVID-19-associated acute disseminated encephalomyelitis: a case report.* MedRxiv, 2020.
47. Novi, G., et al., *Acute disseminated encephalomyelitis after SARS-CoV-2 infection.* Neurol Neuroimmunol Neuroinflamm, 2020. **7**(5).
48. Parsons, T., et al., *COVID-19-associated acute disseminated encephalomyelitis (ADEM).* J Neurol, 2020. **267**(10): p. 2799-2802.
49. Pérez, C.A., *Looking ahead: The risk of neurologic complications due to COVID-19.* Neurol Clin Pract, 2020. **10**(4): p. 371-374.
50. Dogan, L., et al., *Plasmapheresis treatment in COVID-19-related autoimmune meningoencephalitis: Case series.* Brain Behav Immun, 2020. **87**: p. 155-158.
51. Pilotto, A., et al., *Steroid-Responsive Encephalitis in Coronavirus Disease 2019.* 2020. **88**(2): p. 423-427.
52. Perrin, P. and N. Collongues, *Cytokine release syndrome-associated encephalopathy in patients with COVID-19.* 2021. **28**(1): p. 248-258.
53. Emami, A., et al., *Seizure in patients with COVID-19.* 2020. **41**(11): p. 3057-3061.
54. Anand, P., et al., *Seizure as the presenting symptom of COVID-19: A retrospective case series.* Epilepsy Behav, 2020. **112**: p. 107335.
55. Danoun, O.A., et al., *Outcomes of seizures, status epilepticus, and EEG findings in critically ill patient with COVID-19.* Epilepsy Behav, 2021. **118**: p. 107923.

56. Dono, F., et al., *Status epilepticus and COVID-19: A systematic review.* Epilepsy Behav, 2021. **118**: p. 107887.
57. Asadi-Pooya, A.A., *Seizures associated with coronavirus infections.* Seizure, 2020. **79**: p. 49-52.
58. Alonso-Lana, S., et al., *Cognitive and Neuropsychiatric Manifestations of COVID-19 and Effects on Elderly Individuals With Dementia.* Front Aging Neurosci, 2020. **12**: p. 588872.
59. Calderón-Garcidueñas, L., et al., *Environmental Nanoparticles, SARS-CoV-2 Brain Involvement, and Potential Acceleration of Alzheimer's and Parkinson's Diseases in Young Urbanites Exposed to Air Pollution.* J Alzheimers Dis, 2020. **78**(2): p. 479-503.
60. Barrantes, F.J., *Central Nervous System Targets and Routes for SARS-CoV-2: Current Views and New Hypotheses.* ACS Chem Neurosci, 2020. **11**(18): p. 2793-2803.
61. Li, Y.C., W.Z. Bai, and T. Hashikawa, *The neuroinvasive potential of SARS-CoV2 may play a role in the respiratory failure of COVID-19 patients.* J Med Virol, 2020. **92**(6): p. 552-555.