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Date: 28 April 2020

Sources Searched: Medline, Embase, PubMed

Neurologic Manifestations of Covid- 19 (including encephalitis)

[See full search strategy](#)

1. A first case of meningitis/encephalitis associated with SARS-Coronavirus-2.

Author(s): Moriguchi, Takeshi; Harii, Norikazu; Goto, Junko; Harada, Daiki; Sugawara, Hisanori; Takamino, Junichi; Ueno, Masateru; Sakata, Hiroki; Kondo, Kengo; Myose, Natsuhiko; Nakao, Atsuhito; Takeda, Masayuki; Haro, Hirotaka; Inoue, Osamu; Suzuki-Inoue, Katsue; Kubokawa, Kayo; Ogihara, Shinji; Sasaki, Tomoyuki; Kinouchi, Hiroyuki; Kojin, Hiroyuki; Ito, Masami; Onishi, Hiroshi; Shimizu, Tatsuya; Sasaki, Yu; Enomoto, Nobuyuki; Ishihara, Hiroshi; Furuya, Shiomi; Yamamoto, Tomoko; Shimada, Shinji

Source: International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases; Apr 2020; vol. 94 ; p. 55-58

Publication Date: Apr 2020

Publication Type(s): Case Reports

PubMedID: 32251791

Available at [International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases](#) - from Unpaywall

Abstract: Novel coronavirus (SARS-Coronavirus-2: SARS-CoV-2) which emerged in Wuhan, China, has spread to multiple countries rapidly. We report the first case of meningitis associated with SARS-CoV-2 who was brought in by ambulance due to a convulsion accompanied by unconsciousness. He had never been to any foreign countries. He felt generalized fatigue and fever (day 1). He saw doctors nearby twice (day 2 and 5) and was prescribed Laninamivir and antipyretic agents. His family visited his home and found that he was unconsciousness and lying on the floor in his vomit. He was immediately transported to this hospital by ambulance (day 9). Under emergency transport, he had transient generalized seizures that lasted about a minute. He had obvious neck stiffness. The specific SARS-CoV-2 RNA was not detected in the nasopharyngeal swab but was detected in a CSF. Anti- HSV 1 and varicella-zoster IgM antibodies were not detected in serum samples. A brain MRI showed hyperintensity along the wall of right lateral ventricle and hyperintense signal changes in the right mesial temporal lobe and hippocampus, suggesting the possibility of SARS-CoV-2 meningitis. This case warns the physicians of patients who have CNS symptoms.

Database: Medline

2. Meningoencephalitis without respiratory failure in a young female patient with COVID-19 infection in Downtown Los Angeles, early April 2020

Author(s): Duong L.; Liu A.; Xu P.

Source: Brain, Behavior, and Immunity; 2020

Publication Date: 2020

Publication Type(s): Letter

Available at [Brain, behavior, and immunity](#) - from Unpaywall

Database: EMBASE

3. Encephalitis as a clinical manifestation of COVID-19.

Author(s): Ye, Mingxiang; Ren, Yi; Lv, Tangfeng

Source: Brain, behavior, and immunity; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32283294

Available at [Brain, behavior, and immunity](#) - from Unpaywall

Database: Medline

4. Neurological Complications of Coronavirus Disease (COVID-19): Encephalopathy.

Author(s): Filatov, Asia; Sharma, Pamraj; Hindi, Fawzi; Espinosa, Patricio S

Source: Cureus; Mar 2020; vol. 12 (no. 3); p. e7352

Publication Date: Mar 2020

Publication Type(s): Case Reports

PubMedID: 32328364

Available at [Cureus](#) - from Europe PubMed Central - Open Access

Available at [Cureus](#) - from ProQuest (Health Research Premium) - NHS Version

Available at [Cureus](#) - from PubMed Central

Abstract:Coronavirus disease 2019 (COVID-19) is a pandemic. Neurological complications of COVID-19 have not been reported. Encephalopathy has not been described as a presenting symptom or complication of COVID-19. We report a case of a 74-year-old patient who traveled from Europe to the United States and presented with encephalopathy and COVID-19.

Database: Medline

5. Neurological complications of coronavirus and COVID-19.

Author(s): Carod-Artal, F J

Source: Revista de neurologia; May 2020; vol. 70 (no. 9); p. 311-322

Publication Date: May 2020

Publication Type(s): Journal Article Review

PubMedID: 32329044

Available at [Revista de neurologia](#) - from Free Medical Journals . com

Abstract:INTRODUCTIONClinical and experimental studies have shown that the coronavirus family has a certain tropism for the central nervous system. Seven types of coronavirus can infect humans.DEVELOPMENTCoronaviruses are not always confined to the respiratory tract, and under certain conditions they can invade the central nervous system and cause neurological pathologies. The potential for neuroinvasion is well documented in most human coronaviruses (OC-43, 229E, MERS and SARS) and in some animal coronaviruses (porcine haemagglutinating encephalomyelitis coronavirus). Neurological symptoms have been reported in patients affected by COVID-19, such as headache, dizziness, myalgia and anosmia, as well as cases of encephalopathy, encephalitis, necrotising haemorrhagic encephalopathy, stroke, epileptic seizures, rhabdomyolysis and Guillain-Barre syndrome, associated with SARS-CoV-2 infection.CONCLUSIONSFuture epidemiological studies and case records should elucidate the real incidence of these neurological complications, their pathogenic mechanisms and their therapeutic options.

Database: Medline

6. Potential neurological symptoms of COVID-19.

Author(s): Wang, Hai-Yang; Li, Xue-Lin; Yan, Zhong-Rui; Sun, Xiao-Pei; Han, Jie; Zhang, Bing-Wei

Source: Therapeutic advances in neurological disorders; 2020; vol. 13 ; p. 1756286420917830

Publication Date: 2020

Publication Type(s): Journal Article

PubMedID: 32284735

Available at [Therapeutic advances in neurological disorders](#) - from Europe PubMed Central - Open Access

Available at [Therapeutic advances in neurological disorders](#) - from Free Medical Journals . com

Available at [Therapeutic advances in neurological disorders](#) - from Unpaywall

Database: Medline

7. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the Central Nervous System

Author(s): De Felice F.G.; Ferreira S.T.; Munoz D.P.; Tovar-Moll F.; Moll J.

Source: Trends in Neurosciences; 2020

Publication Date: 2020

Publication Type(s): Short Survey

Abstract:Emerging evidence indicates that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the etiologic agent of coronavirus disease 2019 (COVID-19), can cause neurological complications. We provide a brief overview of these recent observations and discuss some of their possible implications. In particular, given the global dimension of the current pandemic, we highlight the need to consider the possible long-term impact of COVID-19, potentially including neurological and neurodegenerative disorders. Copyright © 2020 Elsevier Ltd

Database: EMBASE

8. Guillain Barre syndrome associated with COVID-19 infection: A case report

Author(s): Sedaghat Z.; Karimi N.

Source: Journal of Clinical Neuroscience; 2020

Publication Date: 2020

Publication Type(s): Article

Available at [Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia](#) - from Unpaywall

Abstract:Novel outbreak with coronavirus 2019 began since 31 December 2019. Coronaviruses can cause multiple systemic infections that respiratory complications are the most obvious symptoms. In this report, we describe the symptoms of Guillain Barre syndrome (GBS) in one infected patient with COVID-19, for the first time. We reported a 65-years- old male patient with complaints of acute progressive symmetric ascending quadriparesis. Two weeks prior to hospitalization, the patient suffered from cough, fever, and RT-PCR was reported positive for COVID-19 infection. The electrodiagnostic test showed that the patient is an AMSAN variant of GBS. COVID-19 stimulates inflammatory cells and produces various inflammatory cytokines and as a result, it creates immune-mediated processes. GBS is an immune-mediated disorder and molecular mimicry as a mechanism of autoimmune disorder plays an important role in creating it. It is unclear whether COVID-19 induces the production of antibodies against specific gangliosides. Further investigations should be conducted about the mechanism of GBS in patients with COVID-19, in the future. Copyright © 2020 Elsevier Ltd

Database: EMBASE

9. The Spectrum of Neurologic Disease in the Severe Acute Respiratory Syndrome Coronavirus 2 Pandemic Infection: Neurologists Move to the Frontlines

Author(s): Pleasure S.J.; Green A.J.; Josephson S.A.

Source: JAMA Neurology; 2020

Publication Date: 2020

Publication Type(s): Editorial

PubMedID: 32275291

Available at [JAMA neurology](#) - from Unpaywall

Database: EMBASE

10. The neuroinvasive potential of SARS-CoV2 may be at least partially responsible for the respiratory failure of COVID-19 patients

Author(s): Li Y.-C.; Bai W.-Z.; Hashikawa T.

Source: Journal of Medical Virology; 2020

Publication Date: 2020

Publication Type(s): Review

PubMedID: 32104915

Available at [Journal of medical virology](#) - from Wiley Online Library

Available at [Journal of medical virology](#) - from Unpaywall

Abstract:Following the severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), another highly pathogenic coronavirus named SARS-CoV-2 (previously known as 2019-nCoV) emerged in December 2019 in Wuhan, China, and rapidly spreads around the world. This virus shares highly homological sequence with SARS-CoV, and causes acute, highly lethal pneumonia coronavirus disease 2019 (COVID-19) with clinical symptoms similar to those reported for SARS-CoV and MERS-CoV. The most characteristic symptom of patients with COVID-19 is respiratory distress, and most of the patients admitted to the intensive care could not breathe spontaneously. Additionally, some patients with COVID-19 also showed neurologic signs, such as headache, nausea, and vomiting. Increasing evidence shows that coronaviruses are not always confined to the respiratory tract and that they may also invade the central nervous system inducing neurological diseases. The infection of SARS-CoV has been reported in the brains from both patients and experimental animals, where the brainstem was heavily infected. Furthermore, some coronaviruses have been demonstrated able to spread via a synapse-connected route to the medullary cardiorespiratory center from the mechanoreceptors and chemoreceptors in the lung and lower respiratory airways. In light of the high similarity between SARS-CoV and SARS-CoV2, it is quite likely that the potential invasion of SARS-CoV2 is partially responsible for the acute respiratory failure of patients with COVID-19. Awareness of this will have important guiding significance for the prevention and treatment of the SARS-CoV-2-induced respiratory failure. Copyright © 2020 Wiley Periodicals, Inc.

Database: EMBASE

11 Neurological manifestations in COVID-19 caused by SARS-CoV-2.

Author(s): Baig, Abdul Mannan

Source: CNS neuroscience & therapeutics; May 2020; vol. 26 (no. 5); p. 499-501

Publication Date: May 2020

Publication Type(s): Editorial

PubMedID: 32266761

Available at [CNS Neuroscience & Therapeutics](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

Available at [CNS Neuroscience & Therapeutics](#) - from ProQuest (Health Research Premium) - NHS Version

Available at [CNS Neuroscience & Therapeutics](#) - from PubMed Central

Database: Medline

12. COVID-19 and intracerebral haemorrhage: causative or coincidental?

Author(s): Sharifi-Razavi A.; Karimi N.; Rouhani N.

Source: New Microbes and New Infections; May 2020; vol. 35

Publication Date: May 2020

Publication Type(s): Article

Available at [New Microbes and New Infections](#) - from Europe PubMed Central - Open Access

Available at [New Microbes and New Infections](#) - from Unpaywall

Abstract: Pneumonia appears to be the most common manifestation of coronavirus disease 2019 (COVID-19), but some extrapulmonary involvement, such as gastrointestinal, cardiac and renal, has been reported. The limited clinical data about the virus's behavior to date, especially extrapulmonary symptoms, suggest that we should be aware of the possibility of initial cerebrovascular manifestations of COVID-19. Copyright © 2020 The Author(s)

Database: EMBASE

13. Does SARS-Cov-2 invade the brain? Translational lessons from animal models.

Author(s): Natoli, Silvia; Oliveira, Vanessa; Calabresi, Paolo; Maia, Luis F; Pisani, Antonio

Source: European journal of neurology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article Review

PubMedID: 32333487

Available at [European journal of neurology](#) - from Wiley Online Library

Abstract:The current coronavirus disease (COVID-19) outbreak, caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has raised the possibility of potential neurotropic properties of this virus. Indeed, neurological sequelae of SARS-CoV-2 infection have already been reported and highlight the relevance of considering the neurological impact of coronavirus from a translational perspective. Animal models of SARS and Middle East respiratory syndrome (MERS), caused by structurally similar coronaviruses during the 2002 and 2012 epidemics, have provided valuable data on nervous system involvement by coronaviruses and the potential for CNS spread of SARS-CoV-2. One key finding that may unify these pathogens is that all require angiotensin-converting enzyme 2 (ACE2) as a cell entry receptor. The CoV spike glycoprotein, by which SARS-CoV-2 binds to cell membranes, binds ACE2 with a higher affinity compared to SARS-CoV. The expression of this receptor in neurons and endothelial cells hints that SARS-CoV-2 may have higher neuroinvasive potential compared to previous coronaviruses. Yet, how such invasiveness might contribute to respiratory failure or cause direct neurological damage remains to be determined. Both direct and indirect mechanisms may be of relevance. Clinical heterogeneity potentially driven by differential host immune-mediated responses will require extensive investigation. Development of disease models to anticipate emerging neurological complications and to explore mechanisms of direct or immune-mediated pathogenicity in the short- and medium- term is therefore of great importance. In this brief review, we describe the current knowledge from models of previous coronavirus infections and discuss their potential relevance to COVID-19.

Database: Medline

14. Neurologic manifestations in an infant with COVID-19.

Author(s): Dugue, Rachelle; Cay-Martínez, Karla C; Thakur, Kiran; Garcia, Joel A; Chauhan, Lokendra V; Williams, Simon H; Briese, Thomas; Jain, Komal; Foca, Marc; McBrien, Danielle K; Bain, Jennifer M; Lipkin, W Ian; Mishra, Nischay

Source: Neurology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article

PubMedID: 32327489

Available at [Neurology](#) - from Ovid (LWW Total Access Collection 2019 - with Neurology)

Database: Medline

15. The need for neurologists in the care of COVID-19 patients.

Author(s): Sellner, Johann; Taba, Pille; Öztürk, Serefur; Helbok, Raimund

Source: European journal of neurology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32323891

Available at [European journal of neurology](#) - from Wiley Online Library

Abstract:Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) resulting in severe acute respiratory syndrome in a substantial number of patients. Approximately 5% to 10% of patients need intensive care unit (ICU) admission and mechanical ventilation [1]. The primary symptoms of COVID-19 include fever, dry cough and fatigue [2]. However, a recent report from Shandong, China, disclosed that a subset of patients did not suffer from respiratory symptoms but had neurologic signs and symptoms [3]. Moreover, in a retrospective study from Wuhan, China, neurologic symptoms were observed in 36.4% of the hospitalized patients with COVID-19 infection and pertained to both the central and peripheral nervous system [4].

Database: Medline

16. Explanation for COVID-19 infection neurological damage and reactivations.

Author(s): Roe, Kevin

Source: Transboundary and emerging diseases; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32320129

Available at [Transboundary and emerging diseases](#) - from Wiley Online Library

Abstract:A new pathogenic virus, COVID-19, appeared in 2019, in Wuhan, China, typically causing fever, cough, diarrhea and fatigue and significant mortality (Mao, 2020). From mid-January to mid-February in 2020, 214 patients with both non-severe and severe COVID-19 infections confirmed by nucleic acid tests, were examined by a panel of neurologists. Seventy-eight patients (36.4%) displayed neurological symptoms, including central nervous system symptoms of dizziness, headache, impaired consciousness, acute cerebrovascular disease with either ischemic stroke or cerebral hemorrhage, ataxia, seizures; peripheral nervous system symptoms of taste impairment, smell impairment, vision impairment, and nerve pain; and skeletal muscle injury (Mao, 2020).

Database: Medline

17. The emergence of a novel coronavirus (SARS-CoV-2) disease and their neuroinvasive propensity may affect in COVID-19 patients.

Author(s): Yashavantha Rao, H C; Jayabaskaran, Chelliah

Source: Journal of medical virology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article Review

PubMedID: 32320066

Available at [Journal of medical virology](#) - from Wiley Online Library

Abstract:An outbreak of a novel coronavirus (SARS-CoV-2) infection has recently emerged and rapidly spreading in humans causing a significant threat to international health and the economy. Rapid assessment and warning are crucial for an outbreak analysis in response to serious public health. SARS-CoV-2 shares highly homologous sequences with SARS-CoVs causing highly lethal pneumonia with respiratory distress and clinical symptoms similar to those reported for SARS-CoV and MERS-CoV infections. Notably, some COVID-19 patients also expressed neurologic signs like nausea, headache, and vomiting. Several studies have reported that coronaviruses are not only causing respiratory illness but also invade the central nervous system through a synapse-connected route. SARS-CoV infections are reported in both patients and experimental animals' brains. Interestingly, some COVID-19 patients have shown the presence of SARS-CoV-2 virus in their cerebrospinal fluid. Considering the similarities between SARS-CoV and SARS-CoV-2 in various aspects, it remains to clarify whether the potent invasion of SARS-CoV-2 may affect in COVID-19 patients. All these indicate that more detailed criteria are needed for the treatment and the prevention of SARS-CoV-2 infected patients. In the absence of potential interventions for COVID-19, there is an urgent need for an alternative strategy to control the spread of this disease. This article is protected by copyright. All rights reserved.

Database: Medline

18. Neurological Insights of COVID-19 Pandemic.

Author(s): Das, Gaurav; Mukherjee, Nabanita; Ghosh, Surajit

Source: ACS chemical neuroscience; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article

PubMedID: 32320211

Available at [ACS Chemical Neuroscience](#) - from PubMed Central

Abstract:The novel coronavirus SARS-CoV-2, which was identified after a recent outbreak in Wuhan, China, in December 2019, has kept the whole world in tenterhooks due to its severe life-threatening nature of the infection. The virus is unlike its previous counterparts, SARS-CoV and MERS-CoV, or anything the world has encountered before both in terms of virulence and severity of the infection. If scientific reports relevant to the SARS-CoV-2 virus are noted, it can be seen that the virus owes much of its killer properties to its unique structure that has a stronger binding affinity with the human angiotensin-converting enzyme 2 (hACE2) protein, which the viruses utilize as an entry point to gain accesses to its hosts. Recent reports suggest that it is not just the lung that the virus may be targeting; the human brain may soon emerge as the new abode of the virus. Already instances of patients with COVID-19 have been reported with mild (anosmia and ageusia) to severe (encephalopathy) neurological manifestations, and if that is so, then it gives us more reasons to be frightened of this killer virus. Keeping in mind that the situation does not worsen from here, immediate awareness and more thorough research regarding the neuroinvasive nature of the virus

is the immediate need of the hour. Scientists globally also need to up their game to design more specific therapeutic strategies with the available information to counteract the pandemic. In this Viewpoint, we provide a brief outline of the currently known neurological manifestations of COVID-19 and discuss some probable ways to design therapeutic strategies to overcome the present global crisis.

Database: Medline

19. Central Nervous System Involvement by Severe Acute Respiratory Syndrome Coronavirus -2 (SARS-CoV-2).

Author(s): Paniz-Mondolfi, Alberto; Bryce, Clare; Grimes, Zachary; Gordon, Ronald E; Reidy, Jason; Lednický, John; Sordillo, Emilia Mia; Fowkes, Mary

Source: Journal of medical virology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article

PubMedID: 32314810

Available at [Journal of medical virology](#) - from Wiley Online Library

Available at [Journal of medical virology](#) - from Unpaywall

Abstract:Neurologic sequelae can be devastating complications of respiratory viral infections. We report the presence of virus in neural and capillary endothelial cells in frontal lobe tissue obtained at postmortem examination from a patient infected with Severe Acute Respiratory Syndrome Coronavirus-2. Our observations of virus in neural tissue, in conjunction with clinical correlates of worsening neurologic symptoms, pave the way to a closer understanding of the pathogenic mechanisms underlying CNS involvement. This article is protected by copyright. All rights reserved.

Database: Medline

20. Neurological manifestations of the coronavirus (SARS-CoV-2) pandemic 2019-2020.

Author(s): Liu, Kaiming; Pan, Mengxiong; Xiao, Zheman; Xu, Xiaopei

Source: Journal of neurology, neurosurgery, and psychiatry; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32312873

Available at [Journal of neurology, neurosurgery, and psychiatry](#) - from BMJ Journals - NHS

Available at [Journal of neurology, neurosurgery, and psychiatry](#) - from Unpaywall

Database: Medline

21. Potential Neurologic and Oncologic Implications of the Novel Coronavirus.

Author(s): Aaroe, Ashley; Majd, Nazanin; Weathers, Shiao-Pei; de Groot, John

Source: Neuro-oncology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article

PubMedID: 32296828

Available at [Neuro-oncology](#) - from Oxford Journals - Medicine

Available at [Neuro-oncology](#) - from Unpaywall

Database: Medline

22. Neurologic Features in Severe SARS-CoV-2 Infection.

Author(s): Helms, Julie; Kremer, Stéphane; Merdji, Hamid; Clere-Jehl, Raphaël; Schenck, Malika; Kummerlen, Christine; Collange, Olivier; Boulay, Clotilde; Fafi-Kremer, Samira; Ohana, Mickaël; Anheim, Mathieu; Meziani, Ferhat

Source: The New England journal of medicine; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32294339

Available at [The New England Journal of Medicine](#) - from Massachusetts Medical Society

Available at [The New England Journal of Medicine](#) - from Patricia Bowen Library & Knowledge Service West Middlesex University Hospital NHS Trust (lib302631) Local Print Collection [location] : Patricia Bowen Library and Knowledge Service West Middlesex university Hospital.

Available at [The New England Journal of Medicine](#) - from PubMed Central

Database: Medline

23. Concomitant neurological symptoms observed in a patient diagnosed with coronavirus disease 2019.

Author(s): Yin, Rong; Feng, Wei; Wang, Tonghui; Chen, Gang; Wu, Tao; Chen, Dongrui; Lv, Tangfeng; Xiang, Dawei

Source: Journal of medical virology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32293714

Available at [Journal of medical virology](#) - from Wiley Online Library

Abstract: There has been a global outbreak of coronavirus disease 2019 (COVID-19) since December 2019. In clinical practice, not only fever and respiratory tract symptoms but also multiple organ symptoms are observed in patients diagnosed with COVID-19. Herein, we report a rare case of a patient diagnosed with COVID-19 who manifested with concomitant neurological symptoms. The patient developed fever and respiratory symptoms at disease onset, followed by muscle soreness, and subsequently altered consciousness and psychiatric symptoms, with positive signs based on neurological examination. The patient tested positive for the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) nucleic acid (throat swab). Further, chest computed tomography (CT)

revealed typical COVID-19 findings, and head CT did not reveal significant abnormalities. The patient recovered after treatment and was discharged. This rare case indicates that SARS-CoV-2 can invade the central nervous system, thus causing neurological symptoms and signs. This article is protected by copyright. All rights reserved.

Database: Medline

24. Central nervous system manifestations of COVID-19: A systematic review.

Author(s): Asadi-Pooya, Ali A; Simani, Leila

Source: Journal of the neurological sciences; Apr 2020; vol. 413 ; p. 116832

Publication Date: Apr 2020

Publication Type(s): Journal Article Review

PubMedID: 32299017

Available at [Journal of the neurological sciences](#) - from Unpaywall

Abstract:OBJECTIVEIn this systematic review, we will discuss the evidence on the occurrence of central nervous system (CNS) involvement and neurological manifestations in patients with COVID-19.METHODSMEDLINE (accessed from PubMed) and Scopus from December 01, 2019 to March 26, 2020 were systematically searched for related published articles. In both electronic databases, the following search strategy was implemented and these key words (in the title/abstract) were used: "COVID 19" OR "coronavirus" AND "brain" OR "CNS" OR "neurologic".RESULTSThrough the search strategy, we could identify two articles about neurological involvement by COVID-19. One of these publications was a narrative review and the other one was a viewpoint. However, the authors scanned the reference lists of the included studies and could identify multiple references. One study, specifically investigated the neurological manifestations of COVID-19 and could document CNS manifestations in 25% of the patients. Most of the studies investigated the manifestations of COVID-19 in general.CONCLUSIONWhile neurological manifestations of COVID-19 have not been studied appropriately, it is highly likely that some of these patients, particularly those who suffer from a severe illness, have CNS involvement and neurological manifestations. Precise and targeted documentation of neurological symptoms, detailed clinical, neurological, and electrophysiological investigations of the patients, attempts to isolate SARS-CoV-2 from cerebrospinal fluid, and autopsies of the COVID-19 victims may clarify the role played by this virus in causing neurological manifestations.

Database: Medline

25. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China.

Author(s): Mao, Ling; Jin, Huijuan; Wang, Mengdie; Hu, Yu; Chen, Shengcai; He, Quanwei; Chang, Jiang; Hong, Candong; Zhou, Yifan; Wang, David; Miao, Xiaoping; Li, Yanan; Hu, Bo

Source: JAMA neurology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article

PubMedID: 32275288

Available at [JAMA neurology](#) - from Unpaywall

Abstract:ImportanceThe outbreak of coronavirus disease 2019 (COVID-19) in Wuhan, China, is serious and has the potential to become an epidemic worldwide. Several studies have described typical clinical manifestations including fever, cough, diarrhea, and fatigue. However, to our knowledge, it has not been reported that patients with COVID-19 had any neurologic manifestations.ObjectiveTo study the neurologic manifestations of patients with COVID-19.Design, Setting, and ParticipantsThis is a retrospective, observational case series. Data were collected from January 16, 2020, to February 19, 2020, at 3 designated special care centers for COVID-19 (Main District, West Branch, and Tumor Center) of the Union Hospital of Huazhong University of Science and Technology in Wuhan, China. The study included 214 consecutive hospitalized patients with laboratory-confirmed diagnosis of severe acute respiratory syndrome coronavirus 2 infection.Main Outcomes and MeasuresClinical data were extracted from electronic medical records, and data of all neurologic symptoms were checked by 2 trained neurologists. Neurologic manifestations fell into 3 categories: central nervous system manifestations (dizziness, headache, impaired consciousness, acute cerebrovascular disease, ataxia, and seizure), peripheral nervous system manifestations (taste impairment, smell impairment, vision impairment, and nerve pain), and skeletal muscular injury manifestations.ResultsOf 214 patients (mean [SD] age, 52.7 [15.5] years; 87 men [40.7%]) with COVID-19, 126 patients (58.9%) had nonsevere infection and 88 patients (41.1%) had severe infection according to their respiratory status. Overall, 78 patients (36.4%) had neurologic manifestations. Compared with patients with nonsevere infection, patients with severe infection were older, had more underlying disorders, especially hypertension, and showed fewer typical symptoms of COVID-19, such as fever and cough. Patients with more severe infection had neurologic manifestations, such as acute cerebrovascular diseases (5 [5.7%] vs 1 [0.8%]), impaired consciousness (13 [14.8%] vs 3 [2.4%]), and skeletal muscle injury (17 [19.3%] vs 6 [4.8%]).Conclusions and RelevancePatients with COVID-19 commonly have neurologic manifestations. During the epidemic period of COVID-19, when seeing patients with neurologic manifestations, clinicians should suspect severe acute respiratory syndrome coronavirus 2 infection as a differential diagnosis to avoid delayed diagnosis or misdiagnosis and lose the chance to treat and prevent further transmission.

Database: Medline

26. Should we expect neurological symptoms in the SARS-CoV-2 epidemic?

Author(s): Matías-Guiu, J; Gomez-Pinedo, U; Montero-Escribano, P; Gomez-Iglesias, P; Porta-Etessam, J; Matias-Guiu, J A

Source: Neurologia (Barcelona, Spain); Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article Review

PubMedID: 32299636

Available at [Neurologia \(Barcelona, Spain\)](#) - from Unpaywall

Abstract:INTRODUCTIONThere is growing evidence that SARS-CoV-2 can gain access to the central nervous system (CNS). We revise the literature on coronavirus infection of the CNS associated with neurological diseases.DEVELOPMENTNeurological symptoms were rarely reported in the SARS-CoV and MERS-CoV epidemics, although isolated cases were described. There are also reports of cases of neurological symptoms associated with CoV-OC43 and CoV-229E infection. The presence of neurological lesions, especially demyelinating lesions in the mouse hepatitis virus model, may explain the mechanisms by which coronaviruses enter the CNS, particularly those related with the immune response. This may explain the presence of coronavirus in patients with multiple sclerosis. We review the specific characteristics of SARS-CoV-2 and address the question of whether the high number of cases may be associated with greater CNS involvement.CONCLUSIONAlthough neurological symptoms are not frequent in coronavirus epidemics, the high number of patients with SARS-CoV-2 infection may explain the presence of the virus in the CNS and increase the likelihood of early- or delayed-onset neurological symptoms. Follow-up of patients affected by the SARS-CoV-2 epidemic should include careful assessment of the CNS.

Database: Medline

27. -COVID-19 with acute cerebral infarction: one case report

Author(s): Chen S.; Hu B.; Li H.; Xia Y.; Zhang Y.; Mao L.; Li Y.

Source: Chinese Journal of Neurology; Apr 2020; vol. 53 (no. 4); p. 309-311

Publication Date: Apr 2020

Publication Type(s): Article

Abstract:COVID-19 is caused by the 2019 novel coronavirus, which is characterized by hidden onset, long incubation period, and high contagion. COVID-19 not only attacks the respiratory system, but also affects other systems such as the heart, kidney, and digestive tract, and could be combined with multiple system diseases such as acute cerebrovascular disease. If doctors, especially non-infective or respiratory doctors, do not pay great attention to the disease when they are receiving patients, and take good care of them, they may easily be infected. This article summarizes the case of a concealed onset COVID-19 patient with cerebral infarction, which caused a medical staff infection after intravenous thrombolytic therapy, explores its clinical characteristics, treatment process and analyzes its prevention and control links to help the epidemic situation. In the prevention and control of the disease, the first doctor should pay attention to identification, reduce missed diagnosis, and conduct scientific investigation to reduce occupational infectionCopyright © 2020 by the Chinese Medical Association.

Database: EMBASE

28 Does COVID19 infect the brain? If so, smokers might be at a higher risk

Author(s): Kabbani N.; Olds J.L.

Source: Molecular pharmacology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Article

PubMedID: 32238438

Abstract:COVID19 is a devastating global pandemic with epicenters in China, Italy, Spain, and now the United States. While the majority of infected cases appear mild, in some cases individuals present serious cardiorespiratory complications with possible long-term lung damage. Infected individuals report a range of symptoms from headaches to shortness of breath to taste and smell loss. To that end, less is known about the how the virus may impact different organ systems. The SARS-CoV2 virus, which is responsible for COVID19, is highly similar to SARS-CoV. Both viruses have evolved an ability to enter host cells through direct interaction with the angiotensin converting enzyme 2 (ACE2) protein at the surface of many cells. Published findings indicate that SARS-CoV can enter the human nervous system with evidence from both postmortem brains and detection in cerebrospinal fluid of infected individuals. Here we consider the ability of SARS-CoV2 to enter and infect the human nervous system based on the strong expression of the ACE2 target throughout the brain. Moreover, we predict that nicotine exposure through various kinds of smoking (cigarettes, e-cigarettes, or vape) can increase the risk for COVID19 neuroinfection based on known functional interactions between the nicotinic receptor and ACE2. We advocate for higher surveillance and analysis of neuro-complications in infected cases. Copyright © 2020 American Society for Pharmacology and Experimental Therapeutics.

Database: EMBASE

29. Causes of hypogeusia/hyposmia in SARS-CoV2 infected patients.

Author(s): Finsterer J; Stollberger C

Source: Journal of medical virology; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32311107

Available at [Journal of medical virology](#) - from Wiley Online Library

Available at [Journal of medical virology](#) - from Unpaywall

Abstract:It is well appreciated that SARS-CoV2 does not exclusively affect the lungs.^{1,2} Virus-RNA can be detected in most of the body compartments, including the cerebrospinal fluid (CSF).³ Neurological manifestations have been recently investigated in a retrospective study of 214 SARS-CoV2-infected patients.¹ This article is protected by copyright. All rights reserved.

Database: PubMed

30. Nervous system damage after COVID-19 infection: Presence or absence?

Author(s): Wu Y; Xu X; Yang L; Liu C; Yang C

Source: Brain, behavior, and immunity; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Letter

PubMedID: 32311495

Database: PubMed

31. SARS-CoV-2: Olfaction, Brain Infection, and the Urgent Need for Clinical Samples Allowing Earlier Virus Detection.

Author(s): Butowt R; Bilinska K

Source: ACS chemical neuroscience; Apr 2020

Publication Date: Apr 2020

Publication Type(s): Journal Article

PubMedID: 32283006

Available at [ACS chemical neuroscience](#) - from Unpaywall

Abstract:The novel SARS-CoV-2 virus has very high infectivity, which allows it to spread rapidly around the world. Attempts at slowing the pandemic at this stage depend on the number and quality of diagnostic tests performed. We propose that the olfactory epithelium from the nasal cavity may be a more appropriate tissue for detection of SARS-CoV-2 virus at the earliest stages, prior to onset of symptoms or even in asymptomatic people, as compared to commonly used sputum or nasopharyngeal swabs. Here we emphasize that the nasal cavity olfactory epithelium is the likely site of enhanced binding of SARS-CoV-2. Multiple non-neuronal cell types present in the olfactory epithelium express two host receptors, ACE2 and TMPRSS2 proteases, that facilitate SARS-CoV-2 binding, replication, and accumulation. This may be the underlying mechanism for the recently reported cases of smell dysfunction in patients with COVID-19. Moreover, the possibility of subsequent brain infection should be considered which begins in olfactory neurons. In addition, we discuss the possibility that olfactory receptor neurons may initiate rapid immune responses at early stages of the disease. We emphasize the need to undertake research focused on additional aspects of SARS-CoV-2 actions in the nervous system, especially in the olfactory pathway.

Database: PubMed

32. Nervous system involvement after infection with COVID-19 and other coronaviruses.

Author(s): Wu, Yeshun; Xu, Xiaolin; Chen, Zijun; Duan, Jiahao; Hashimoto, Kenji; Yang, Ling; Liu, Cunming; Yang, Chun

Source: Brain, behavior, and immunity; Mar 2020

Publication Date: Mar 2020

Publication Type(s): Journal Article Review

PubMedID: 32240762

Available at [Brain, behavior, and immunity](#) - from Unpaywall

Abstract: Viral infections have detrimental impacts on neurological functions, and even to cause severe neurological damage. Very recently, coronaviruses (CoV), especially severe acute respiratory syndrome CoV 2 (SARS-CoV-2), exhibit neurotropic properties and may also cause neurological diseases. It is reported that CoV can be found in the brain or cerebrospinal fluid. The pathobiology of these neuroinvasive viruses is still incompletely known, and it is therefore important to explore the impact of CoV infections on the nervous system. Here, we review the research into neurological complications in CoV infections and the possible mechanisms of damage to the nervous system.

Database: Medline

33. Sars-Cov-2: Underestimated damage to nervous system.

Author(s): Zhou L; Zhang M; Wang J; Gao J

Source: Travel medicine and infectious disease; Mar 2020 ; p. 101642

Publication Date: Mar 2020

Publication Type(s): Letter

PubMedID: 32220634

Available at [Travel Medicine and Infectious Disease](#) - from Unpaywall

Database: PubMed

Strategy 843886

#	Database	Search term	Results
1	Medline	exp ENCEPHALITIS/	47848
2	Medline	(Encephalitis).ti,ab	38582
3	Medline	(1 OR 2)	64504
4	Medline	("Covid 19" OR "Covid 2019").ti,ab	5828
5	Medline	("novel coronavirus").ti,ab	1611
6	Medline	("SARS-CoV-2").ti,ab	1562
7	Medline	("severe acute respiratory coronavirus 2").ti,ab	8
8	Medline	exp BETACORONAVIRUS/	7486
9	Medline	exp CORONAVIRUS/	12495
10	Medline	(4 OR 5 OR 6 OR 7 OR 8 OR 9)	18218
11	Medline	(3 AND 10)	197
12	Medline	(neurologic*).ti,ab	292714
13	Medline	(10 AND 12)	145
14	EMBASE	exp ENCEPHALITIS/	96554
15	EMBASE	(Encephalitis).ti,ab	44053
16	EMBASE	exp "NEUROLOGIC DISEASE"/	3379801
17	EMBASE	(neurologic*).ti,ab	424632
18	EMBASE	(14 OR 15 OR 16 OR 17)	3498464
19	EMBASE	("Covid 19" OR "Covid	5721

		2019").ti,ab	
20	EMBASE	("novel coronavirus").ti,ab	1670
21	EMBASE	("SARS-CoV-2").ti,ab	1583
22	EMBASE	("severe acute respiratory coronavirus 2").ti,ab	8
23	EMBASE	exp "SARS-RELATED CORONAVIRUS"/	6437
24	EMBASE	exp "CORONAVIRUS INFECTION"/	12393
25	EMBASE	(19 OR 20 OR 21 OR 22 OR 23 20002 OR 24)	
26	EMBASE	(18 AND 25)	1256
27	Medline	exp "NEUROLOGIC MANIFESTATIONS"/	1209464
28	Medline	(10 AND 27)	49
29	PubMed	(Encephalitis).ti,ab	66839
30	PubMed	("Covid 19" OR "Covid 2019").ti,ab	6762
31	PubMed	("novel coronavirus").ti,ab	1719
32	PubMed	("SARS-CoV-2").ti,ab	2010
33	PubMed	("severe acute respiratory coronavirus 2").ti,ab	8
34	PubMed	(30 OR 31 OR 32 OR 33)	7750
35	PubMed	(29 AND 34)	5
36	PubMed	(neurolog*).ti,ab	854454
37	PubMed	(34 AND 36)	159
38	PubMed	(encephalopathy).ti,ab	1307553

39	PubMed	(34 AND 38)	28
40	PubMed	("nervous system").ti,ab	492369
41	PubMed	(34 AND 40)	34