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Neurological Manifestations in Central Nervous System and Peripheral Nervous System

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Abstract

COVID-19 is a respiratory illness caused by the SARS-CoV-2 virus. The disease was first identified in Wuhan, China in December 2019 and has since spread globally. COVID-19 primarily spreads through respiratory droplets when an infected person coughs or sneezes. Symptoms of COVID-19 can range from mild to severe, with some patients requiring hospitalization. The most common symptoms of COVID-19 include fever, cough, and shortness of breath, but it is now understood that neurological symptoms can also occur.

Keywords: Neurological manifestations • Nervous system • Respiratory illness • Encephalopathy • Brain disorder

Introduction

Since the beginning of the COVID-19 pandemic, it has become clear that the disease can have neurological manifestations in addition to the well-known respiratory symptoms. As more data has been collected, researchers have gained a better understanding of the neurological effects of COVID-19 and how they present in hospitalized patients. This article will provide an overview of the neurological manifestations upon hospital presentation in COVID-19 patients. The neurological manifestations of COVID-19 can be diverse and may present differently in different patients. These manifestations may be the result of the virus directly infecting the nervous system or from indirect effects on the body, such as the immune response or blood clotting. The following are the most commonly reported neurological manifestations upon hospital presentation in COVID-19 patients [1].

Literature Review

Stroke is one of the most serious neurological manifestations of COVID-19. The virus has been shown to increase the risk of stroke in some patients, particularly those with pre-existing cardiovascular disease. COVID-19 patients who experience a stroke may present with sudden weakness or numbness on one side of the body, difficulty speaking, or confusion. Imaging studies can confirm the presence of a stroke, and treatment may include blood thinners or surgery.

Encephalopathy is a general term used to describe any disorder that affects the functioning of the brain. COVID-19 patients may present with encephalopathy, which can manifest as confusion, disorientation, or altered consciousness. Encephalopathy may be caused by a direct infection of the brain by the virus, or by the body's immune response. Treatment may include medications to control symptoms, such as antipsychotics or sedatives. Seizures are another potential neurological manifestation of COVID-19. They may be caused by the virus directly affecting the brain or as a result of the body's immune response. Seizures may present as convulsions, loss of consciousness, or involuntary movements. Treatment may include antiepileptic medications or sedatives [2].

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Discussion

Guillain-Barré Syndrome (GBS) is a rare neurological disorder that can be triggered by an infection. COVID-19 patients have been reported to develop GBS, which is characterized by muscle weakness, numbness, or tingling in the extremities. GBS is caused by the immune system attacking the nerves, leading to a loss of muscle control. Treatment may include immunoglobulin therapy or plasmapheresis to remove harmful antibodies from the blood.

The COVID-19 pandemic caused by the SARS-CoV-2 virus has had a significant impact on global health. While the primary respiratory symptoms of COVID-19 have been well documented, there is growing evidence of neurological manifestations upon hospital presentation in COVID-19 patients. These neurological symptoms are thought to result from direct viral invasion of the nervous system, immune-mediated damage, or systemic effects of the disease. This article will provide an overview of the neurological manifestations seen in COVID-19 patients and their implications for patient management and outcomes [3].

The neurological manifestations of COVID-19 can be broadly divided into central nervous system (CNS) and peripheral nervous system (PNS) symptoms. CNS symptoms include encephalopathy, headache, dizziness, confusion, and impaired consciousness. PNS symptoms include anosmia, ageusia, neuralgia, and neuropathy. Some of the most commonly reported neurological manifestations of COVID-19 are described below.

Encephalopathy refers to a broad category of brain disorders that cause altered mental function, such as confusion, delirium, and coma. COVID-19 patients with encephalopathy often have abnormal brain imaging and cerebrospinal fluid (CSF) findings. The exact mechanism of encephalopathy in COVID-19 is not yet understood, but it is thought to result from direct viral invasion of the brain or an immune-mediated response. Headache is a common symptom of COVID-19 and is often accompanied by fever, cough, and fatigue. The exact mechanism of headache in COVID-19 is not clear, but it may result from inflammation or increased intracranial pressure [4].

Anosmia (loss of smell) and ageusia (loss of taste) are common symptoms of COVID-19 and are thought to result from direct viral invasion of the olfactory nerves. These symptoms are often the earliest and most specific indicators of COVID-19 infection.

COVID-19 patients may develop peripheral neuropathy, which is characterized by numbness, tingling, and weakness in the hands and feet. The exact mechanism of neuropathy in COVID-19 is not yet understood, but it may result from a systemic inflammatory response or direct viral invasion of the nerves. COVID-19 patients are at an increased risk of stroke, particularly those with severe disease. The exact mechanism of stroke in COVID-19 is not yet understood, but it may result from blood clotting abnormalities, endothelial dysfunction, or direct viral invasion of the blood vessels.

Seizures have been reported in COVID-19 patients, particularly those with encephalopathy. The exact mechanism of seizures in COVID-19 is not yet understood, but it may result from direct viral invasion of the brain or an immune-

mediated response. The neurological manifestations of COVID-19 have significant implications for patient management and outcomes. Patients with neurological symptoms may require additional monitoring and treatment, particularly those with severe symptoms or those with pre-existing neurological conditions. Some of the key implications for patient management and outcomes [5].

Acute disseminated encephalomyelitis (ADEM) is a rare but serious neurological disorder that can occur in COVID-19 patients. ADEM is characterized by inflammation in the brain and spinal cord, leading to symptoms such as fever, headache, and confusion. Imaging studies may reveal lesions in the brain or spinal cord. Treatment may include steroids or immunoglobulin therapy.

SMA is a genetic disorder that affects the motor neurons in the spinal cord, leading to muscle weakness and wasting. There are four types of SMA, with type 1 being the most severe. Gene replacement therapy has been approved for the treatment of SMA, specifically targeting the survival motor neuron 1 (SMN1) gene, which is mutated in patients with SMA. The therapy involves delivering a functional copy of the SMN1 gene to the patient's cells using a viral vector. This treatment has shown promising results in clinical trials, with many patients experiencing significant improvement in motor function [6].

Conclusion

DMD is a genetic disorder that causes progressive muscle weakness and wasting. It is caused by mutations in the dystrophin gene, which encodes a protein that is essential for muscle function. Gene editing and antisense therapy are both being investigated as potential treatments for DMD. Gene editing using CRISPR/Cas9 has shown promise in preclinical studies, with researchers successfully restoring dystrophin expression in mouse models of DMD. Antisense therapy is also being developed, with a drug called eteplirsen already approved for use in the United States. Eteplirsen works by inducing exon skipping, allowing the production of a shortened but functional version of the dystrophin protein.

Epilepsy is a neurological disorder characterized by recurrent seizures. Many different genes have been implicated in the development of epilepsy, making it a prime target for gene-targeted therapies. One approach being investigated is RNAi, which has shown promise in preclinical studies. Researchers have identified specific genes that play a role in epilepsy and developed RNAi molecules to silence them. By targeting these genes, it may be possible to prevent seizures in patients with epilepsy.

Acknowledgement

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Conflict of Interest

None.

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