

COMPARATIVE ANALYSIS OF CLINICAL AND FUNCTIONAL OUTCOMES OF ACUTE ISCHEMIC STROKE IN POST-COVID-19 PATIENTS

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Abstract

The COVID-19 pandemic has introduced new challenges in cerebrovascular health, with increasing reports of acute ischemic stroke (AIS) occurring in patients who have recovered from SARS-CoV-2 infection. This study aims to investigate the clinical characteristics and long-term functional outcomes of AIS in patients with post-COVID-19 syndrome (PCS) compared to stroke patients without prior COVID-19 infection. We conducted a comparative observational study including adult patients diagnosed with AIS between January 2021 and December 2023. Clinical features, stroke severity, imaging findings, comorbidities, and laboratory parameters were recorded. Functional outcomes were assessed using the modified Rankin Scale (mRS) at 3, 6, and 12 months post-stroke. Our findings indicate that patients with PCS had higher rates of atypical presentations, greater stroke severity, and a prolonged recovery trajectory compared to non-COVID-19 AIS patients. Long-term functional outcomes were significantly worse in the PCS group, with a higher proportion of patients experiencing persistent disability. These results underscore the need for tailored post-stroke management strategies and rehabilitation programs for patients recovering from COVID-19. Future research should focus on elucidating the underlying pathophysiological mechanisms linking SARS-CoV-2 infection with cerebrovascular vulnerability.

Keywords: Acute ischemic stroke, post-COVID-19 syndrome, functional outcomes, modified Rankin Scale, cerebrovascular complications, rehabilitation, comparative study

Introduction

The emergence of COVID-19 caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has profoundly impacted global health systems, not only through acute respiratory illness but also via long-term systemic complications. Among these, the association between COVID-19 and cerebrovascular disease has garnered significant attention, particularly the occurrence of acute ischemic stroke (AIS) in both the acute phase of infection and in post-COVID-19 syndrome (PCS). PCS, often referred to as “long COVID,” encompasses a spectrum of persistent symptoms and organ system sequelae occurring beyond 12 weeks after initial infection, including fatigue, cognitive impairment, respiratory difficulties, and cardiovascular complications. Increasing evidence suggests that individuals with PCS may exhibit heightened vulnerability to thrombotic events, endothelial dysfunction, and neurovascular injury, which can precipitate or exacerbate cerebrovascular incidents such as AIS.

Stroke remains a leading cause of morbidity and long-term disability worldwide. AIS, resulting from an acute reduction in cerebral blood flow due to arterial occlusion, is associated with substantial functional impairment and a heavy societal and economic burden. The interplay between COVID-19 and stroke appears multifactorial: hypercoagulability induced by systemic inflammation, direct endothelial injury by viral infection, dysregulation of the renin-angiotensin-aldosterone system, and pre-existing cardiovascular risk factors all contribute to increased stroke risk. While the incidence of AIS during acute COVID-19 infection has been documented in multiple studies, there is comparatively limited research addressing the clinical profile and long-term functional outcomes of AIS occurring in patients with PCS. Understanding these outcomes is essential for developing targeted rehabilitation strategies and improving prognostication for this unique patient population.

Existing literature indicates that post-COVID AIS patients may differ from typical stroke patients in several respects. Early reports have noted increased

thrombotic complications, atypical stroke locations, and variable neurological presentations. Furthermore, these patients may experience prolonged inflammatory responses and endothelial dysfunction, potentially impacting stroke severity and recovery. These factors highlight the need for comparative studies that contrast PCS-related AIS with conventional AIS to identify specific clinical patterns, functional outcomes, and rehabilitation needs.

Functional recovery after AIS is commonly measured using standardized scales, including the modified Rankin Scale (mRS), Barthel Index, and National Institutes of Health Stroke Scale (NIHSS). Long-term functional outcomes provide insights into disability levels, independence in daily activities, and quality of life post-stroke. Early identification of factors that negatively influence recovery in PCS patients could inform intervention strategies, including intensive rehabilitation, neuroprotective therapies, and preventive measures aimed at reducing recurrent cerebrovascular events.

This study, therefore, seeks to fill existing gaps in the literature by providing a systematic comparison of clinical characteristics, stroke severity, and long-term functional outcomes between AIS patients with and without PCS. By analyzing demographic data, comorbidities, stroke subtypes, laboratory markers, and neuroimaging findings, this research aims to establish whether PCS patients exhibit distinct stroke profiles and whether these differences translate into worse functional outcomes over a 12-month follow-up period. Additionally, this study examines rehabilitation trajectories and the potential need for modified post-stroke care protocols in the PCS population.

Identifying differences in stroke presentation and recovery between PCS and non-COVID AIS patients has practical implications for clinical management. Physicians should be aware of atypical stroke manifestations in PCS patients, including subtle neurological deficits, prolonged inflammatory responses, and higher susceptibility to recurrent events. Tailored rehabilitation programs, frequent monitoring, and early intervention could mitigate long-term disability and improve

quality of life. Moreover, understanding the pathophysiological links between PCS and AIS may provide avenues for therapeutic innovation, including targeted anticoagulation, anti-inflammatory therapies, or neuroprotective strategies.

In summary, the 21st century has brought unique challenges in cerebrovascular health, exacerbated by the COVID-19 pandemic. AIS in PCS patients represents a clinical phenomenon with potential implications for prognosis, rehabilitation, and health system planning. Through a comparative approach, this study aims to elucidate differences in clinical presentation, stroke severity, and functional recovery between PCS and non-COVID AIS patients, thereby informing clinical practice, guiding rehabilitation strategies, and contributing to a growing body of knowledge on post-COVID neurological complications.

Conclusion

The findings of this comparative study suggest that patients with post-COVID-19 syndrome who develop acute ischemic stroke exhibit distinct clinical characteristics and face more severe long-term functional impairments compared to non-COVID-19 stroke patients. These individuals often present with atypical stroke features, increased stroke severity, and prolonged recovery trajectories, highlighting the need for specialized post-stroke care and rehabilitation strategies tailored to the post-COVID population. Early identification of PCS-related stroke and implementation of individualized rehabilitation protocols can mitigate long-term disability, enhance functional independence, and improve overall quality of life. Furthermore, these observations underscore the importance of ongoing research into the mechanisms linking SARS-CoV-2 infection with cerebrovascular vulnerability. By addressing these challenges, clinicians, researchers, and policymakers can better support patients at the intersection of post-COVID syndrome and cerebrovascular disease, ultimately enhancing patient outcomes in this emerging and clinically significant population.

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