Clinical Characteristics and Functional Outcomes of COVID-19 Patients with Acute Ischemic Stroke

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Introduction

- Neurological complications frequently occur in patients with COVID-19 infection, affecting up to 57% of patients[1].
- SARS-CoV-2 has been shown to induce a state of hypercoagulability that predisposes to both arterial and venous thrombotic events[2].
- Stroke appears to complicate 0.2 to 5% of COVID-19 infections [1,3,4].
- Patients with vascular risk factors associated with stroke, such as hypertension, diabetes mellitus, and previous cardiac or cerebrovascular disease are at an increased risk of mortality and morbidity[5-8].

Background and purpose

- In this study, we describe the clinical characteristics and functional outcomes of stroke in patients with COVID-19 infection and evaluate the hypothesis that COVID-19 infection worsens the prognosis of patients with a stroke, possibly due to harmful effects of the virus.

Methods

- We conducted a prospective, observational, single-center cohort study at King Abdullah University Hospital (KAUH), the main tertiary hospital in North of Jordan.
- The recruitment of patients began on October 16th, 2020, and ended on October 15th, 2021.
- All patients diagnosed with acute ischemic stroke and COVID-19 infection were included. Patients were identified by neuroimaging studies and included in the study if the imaging showed acute ischemic stroke and classified according to the nucleic acid amplification tests as COVID-19 positive or COVID-19 negative.
- Patients underwent a standard diagnostic evaluation, including brain imaging, intracranial and extracranial vascular imaging, and cardiac evaluation.
- All patients presenting with hemorrhagic stroke or transient ischemic attack were excluded. The ischemic stroke subtype was classified according to the Trial of ORG 10172 in Acute Stroke Treatment Criteria (TOAST).



Results

- A total of 178 patients with radiologically proven ischemic stroke were included with a mean (SD) age of 67.3 (12), and more than half of the cases were males (96/178; 53.9%). Thirty-six cases were COVID-19 positive related and had a mean (SD) age of 70 (11.5). Out of 19 cases of mortality, 15 (79%) occurred in the COVID-19 positive group.
- Laboratory results at admission showed that COVID-19 positive patients had a significantly higher median C-reactive protein levels (P < .001) and Erythrocyte sedimentation rate (P < .001), also, coagulation profiles showed that COVID-19 positive patients had a significantly higher median prothrombin time (P < .001) and D-dimer levels (P < .001) as well.
- When compared to COVID-19 negative patients, COVID-19 positive patients were more likely to be admitted to the ICU (41.7% vs. 4.9%; p <.001) and were more likely to have a higher median NIHSS score at baseline (11 vs. 6; p = .043), after 72 hours (12 vs. 6; p = .006), and at discharge (16 vs. 4; p <.001).
- They were also more likely to have a higher median mRS score after three months follow-up (p <.001).
- COVID-19 positive patients also had a higher rate of hemorrhagic transformation (16.7% vs 1.4%; P <.001), a higher median hospital stays (P < .001), and a higher mortality rate (41.7% vs 2.8%; P < .001). The detailed univariate analysis between the COVID-19 positive and COVID-19 negative stroke patients is represented in **Table 1**.
- As for the etiology of the strokes, COVID-19 positive patients had more strokes attributed to cryptogenic (50% vs. 10.6%) and cardioembolic (27.8% vs. 7%) causes, and less attributed to lacunar (8.3% vs. 54.2%), atherothrombotic (8.3% vs. 23.9%), and other determining causes (5.6% vs. 6.3%; P < .001 for the overall comparison), **Figure 1**.
- The multivariate analysis showed that an increase in the NIHSS score at admission was associated with an increase in the likelihood of having unfavorable outcome after three months. (OR=1.387, 95% CI [1.238 – 1.553]; P < .001). While having COVID-19 infection didn't impact the likelihood of having an unfavorable outcome significantly (OR=1.098, 95%CI [0.270 – 4.473]; P = .896).

Variables	Total patients, n = 178	Non-COVID-19, n = 142	COVID-19, n = 36	p-value
Demographics				
Age, mean ± SD	67.3 ± 12	66.6 ± 12.1	70 ± 11.5	.121
Gender (male), n (%)	96 (54)	76 (54)	20 (56)	.674
NIHSS score				
Baseline NIHSS, median (IQR)	7 (4-12)	6 (4-11)	11 (5-13.5)	.043
At 72 h, median (IQR)	7 (5-11)	6 (5-10)	12 (4.5-16)	.006
At discharge, median (IQR)	4 (2-11)	4 (2-8)	16 (3.5-22)	<.001
mRS score				
mRS at discharge, median (IQR)	2 (1-3)	2 (1-2)	2 (1-3)	.092
mRS after 3m follow-up, median (IQR)	3 (1-4)	2.5 (1-4)	4 (2-6)	<.001
Unfavorable functional outcome, n (%)	95 (53)	71 (50)	24 (67)	.073
Metrics				
Stroke Unit admission, n (%)	155 (87)	135 (95)	20 (56)	<.001
ICU admission, n (%)	22 (12)	7 (5)	15 (42)	<.001
Hemorrhagic transformation, n (%)	8 (5)	2 (1)	6 (17)	.001
Hospital stay (days), median (IQR)	4 (3-8)	4 (3-6)	10 (4-16)	<.001
Deaths, n (%)	19 (11)	4 (3)	15 (42)	<.001

Table 1: General demographics and clinical data of the whole cohort, and it's stratification based on the COVID-19 infection status..

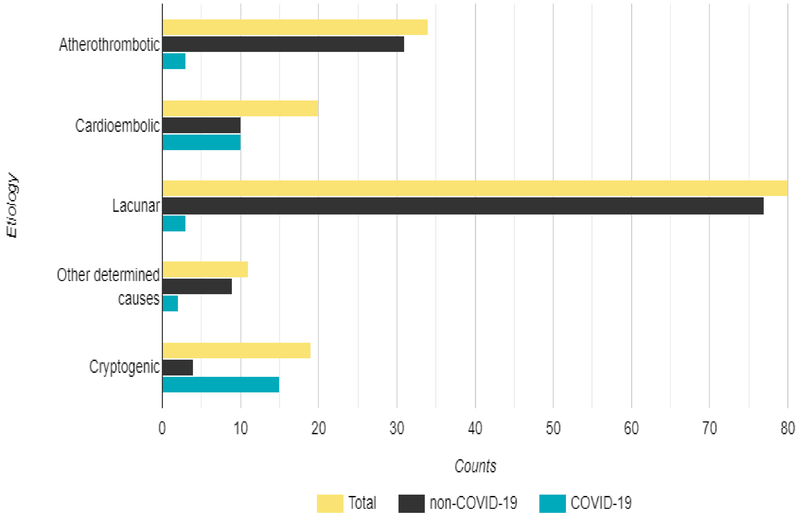


Figure 1: Distribution of the strokes based on etiology.

Conclusions

- Patients with ischemic strokes occurring with concomitant COVID-19 infection have more severe strokes and unfavorable functional outcomes after three months of follow-up, when compared with COVID-19 negative.
- The pathophysiology behind strokes occurring in COVID-19 patients remains not fully understood. Therefore, future controlled, prospective international studies with a higher sample size are needed to establish an evidence-based approach to stroke occurring in COVID-19 patients and elaborate more on their outcomes.

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PHYSICAL THERAPY INTERVENTIONS FOR IMPROVING BALANCE IN INCOMPLETE SPINAL CORD INJURY: A SYSTEMATIC REVIEW

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ABSTRACT

Objective: Evaluate the efficacy of physiotherapy interventions for improving balance in patients with incomplete spinal cord injury.

Data Sources: A systematic search was performed for randomized controlled trials available from January 2009 until June 2019, using Cochrane Database of Systematic Reviews, PubMed, and Physiotherapy Evidence Database. Relevant systematic reviews and references were also searched.

Study Selection: Studies evaluating the efficacy of physiotherapy interventions in improving balance outcomes in adult patients with incomplete spinal cord injury grades C or D (more than one 1-year post-injury) were elected and evaluated by authors, excluding robotic-assisted therapies or technological devices.

Data Extraction: Eligible studies were critically appraised by Physiotherapy Evidence Database scale and Cochrane Risk of Bias scale. Sample characteristics, intervention, control, outcome measures, and results were evaluated with regards to balance.

Data synthesis: Only five studies were included in this systematic review. Sample sizes were too small in all included trials. Interventions used to improve balance were divided into three categories for better analysis of results; Whole Body Vibration, Mental Practice, and Body Weight Support. Interventions were compared to conventional physical therapy. Improvement in balance was greater after Whole-Body Vibration compared with conventional physiotherapy, Body Weight Support with fixed track showed significant balance improvement, while Body Weight Support using treadmill did not indicate a significant balance improvement. Mental practice was not effective when added to conventional physiotherapy techniques in balance improvement.

Conclusion: Insufficient evidence was found for the efficacy of physiotherapy interventions in improving balance in incomplete spinal cord injury patients. Studies with larger sample sizes are needed with deeper evaluation of physiotherapy treatments focusing specifically in improving balance in incomplete spinal cord injury patients.



BIOGRAPHY

Msc. Blanca F. Vellve is a Neurorehabilitation Professor at the Autonomous University of Yucatan, currently working as a clinician in the Integrative Rehabilitation Laboratoy at the University Rehabilitation Unit; along with a multidisciplinary team composed of physiotherapists, physiatrists, and nutritionists.

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ABOUT RESEARCH TOPIC

Spinal cord injury (SCI) affects approximately 250,000 to 500,000 people globally per annum [1]. The severity of SCI is calculated according to the American Spinal Injury Association Impairment Scale (ASIA or AIS). ASIA C-D Incomplete Spinal Cord Injuries (ISCI) represent the population with higher probability of recovering ambulation; it is considered that around 80–100% of ISCI ASIA D individuals have gait recovery after the first year of injury [2], however, for ambulation recovery to happen, individuals must have certain abilities, in particular, adequate dynamic balance [3].

Many studies have highlighted the relation between balance impairment in ISCI, risk of falls, independence, and Quality of Life (QoL). Consequently, approaches to improve balance should be a key focus of physical therapy rehabilitation [4].

Technological devices, such as exoskeletons and robot-assisted therapies, continue to be a consistent theme in recent literature, however, this approach has a cost- limitation when compared to other conventional therapies, furthermore, there is insufficient evidence of the superiority of technological interventions over conventional physiotherapy techniques in terms of improving balance outcomes [5].

Physical therapy options for improving balance in ISCI are diverse, including for instance: Functional Electrical Stimulation (FES) , Sensory Feedback Mechanisms, Locomotor Training (LM), Kinesiotaping for Sensory Inputs, Whole Body Vibration (WBV), Virtual Therapy Feedback, and Body Weight Support (BWS).

Balance is not commonly considered a primary outcome, and RCTs in ISCI have small sample sizes to create a clinical impact, accordingly, carrying out quality reviews on balance outcomes in ISCI is necessary, with summarised updated information, and analysis of different options and methods, aiming at improving gait capacity, QOL, and therefore, reducing the economic burden that this global health problem represents.

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