ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 04 | April - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

NEUROVASCULAR HYPERCOAGULABILTY IN COVID-19-A PICTORAL ESSAY

Radio-Diagnosis

Dr.Prashant Moorthy	MD Radio-diagnosis Assistant Professor
Dr Jeban Chella Bruce*	Radio-diagnosis Resident *Corresponding Author
Dr. Samaran Meganathan	Radio-diagnosis Resident
Dr. Dinesh Babu Jawahar	Radio-diagnosis Resident

ABSTRACT

Acute stroke is a medical emergency during the COVID-19 pandemic as COVID-19 being a hypercoagulable state. COVID-19 present mostly with respiratory system related symptoms, while others present with atypical gastrointestinal, cardiovascular, or neurological manifestations. Here we present a series of three patients with COVID-19 that presented with acute stroke [1].

Methods: Hospital PACS was searched for COVID RTPCR positive patients who presented with weakness. Patients who had imaging suggestive of stroke and PCR-confirmed COVID-19 infection were included in the study. Informed consent was obtained.

KEYWORDS

INTRODUCTION:

The novel corona virus, severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), emerged in Wuhan, China at the end of 2019 and is now a pandemic. The disease spectrum ranges from mild illness to severe illness with multi-organ failure and death. Coagulopathy, in the form of venous and arterial thromboembolism, has been associated with COVID-19

This is the seventh known corona virus to infect humans [**2**]. Two other notable examples include severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) [3].

Chest CT can detect some characteristic features in almost all patients with COVID-19 pneumonia [4]

Imaging should be employed only if the patient is symptomatic (e.g. suspected pulmonary thrombo-embolism, distinguishing organising pneumonia from acute respiratory distress syndrome [ARDS], excluding stroke or encephalopathy in those with neurological symptoms, etc.)[5]

Microbiological RT-PCR testing may be highly specific but sensitivity has been ranges from 60–70%.

Multiple negative tests may be required to exclude COVID-19 and testing kits in such high number may not be available in developing countries with high population. In a study of 1,014 patients with both CT chest and RT-PCR, the sensitivity of CT was 97% relative to positive RT-PCR. [6]

The fibrin D-dimer levels were 12-fold higher in patients who developed stroke indicating a hypercoagulable state. [7]. Interleukin-6 and Ferritin also plays an important role in predicting hypercoagula bility and cytokine storm states.

CASE REPORTS

CASE 1:

39-year-old male with no significant past medical presented to the emergency room (ER) with fever, weakness, respiratory distress, and altered mental status. He had a sick contact at home. Vital signs on presentation were fever of 101.6° F, tachycardia with heart rate (HR) of 106 BPM, hypoxemia with saturation of 87% on 100% non-rebreathable mask. The patient was intubated in the emergency room in view of hypoxemic respiratory failure. A computed tomography (CT) scan of the head was performed which demonstrated hyper-acute infarct (hyperdense right MCA with obscuration of insular cortex) (Fig 1.1). MRI was performed and showed diffusion restriction with low ADC value-ADC-0.246 X 10'3 mm'2/s) CT chest demonstrated bilateral peripheral patchy airspace opacities and ground-glass opacities with vascular involvement; characteristic for viral infection from COVID-19(Fig 1.2 and 1.3). COVID-19 polymerase chain reaction (PCR) detected the virus**.** A repeat CT of the head demonstrated progression toward a sub acute infarct of the right MCA territory (Fig 1.4). The patient was treated with LMW heparin and other supportive measures.

CASE 1 Figures:

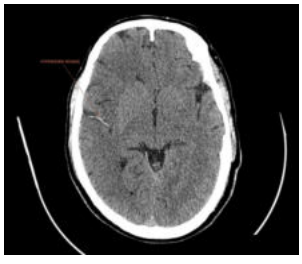

Fig 1.1: CT Brain showing hyperdense M3 segment of Middle Cerebral Artery.

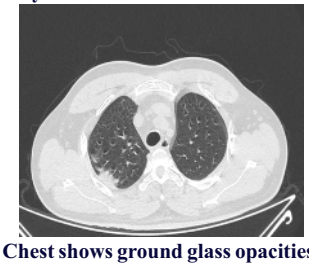

Fig 1.2: CT Chest shows ground glass opacities with consolidatory changes

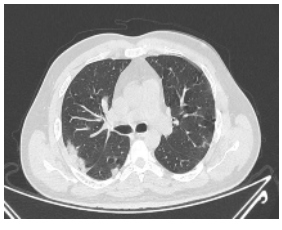

Fig 1.3: CT Chest shows prominent vessels in the involved segments.

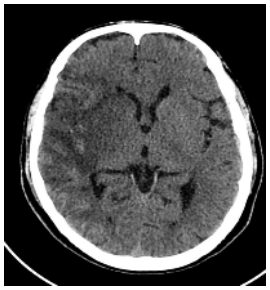

Fig 1.4: Large area of ill defined intra-axial hypodensities in the right fronto-parieto- temporal parenchyma

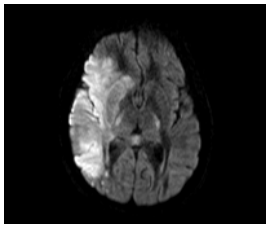

Fig 1.5 DWI showing a large area of hyperintensity (diffusion restriction).

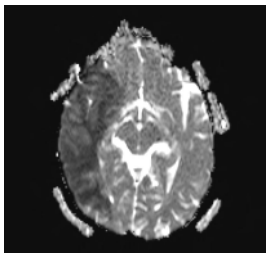

FIG 1.6 Corresponding ADC showing hypointensity (ADC-0.246 X 10'3 mm'2/s)

CASE 2

69 year old patient with a past medical history of hypertension, dyslipidemia presented to the emergency department(ED) with fever, respiratory distress, and right sided weakness. Vital signs on presentation were fever of 102° F; tachycardia with heart rate (HR) of 110 BPM, hypoxemia with saturation of 89% on 100% non-rebreathable mask CT and MRI was done and showed the following findings. CT thorax-Ground glass opacities noted in bilateral lung fields (Fig 2.1). CT Brain-A large wedge shaped hypodensity in left MCA territory(Fig 2.2).MRI brain-DWI image shows wedge shaped area of hyperintensity (diffusion restriction) with low ADC(Fig 2.3 and 2.4)

CASE 2 FIGURES:

Fig 2.1: CT chest shows ground glass opacities.

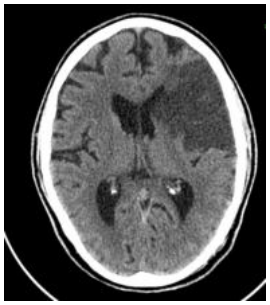

Fig 2.2- CT Brain-A large wedge shaped hypodensity in left MCA territory.

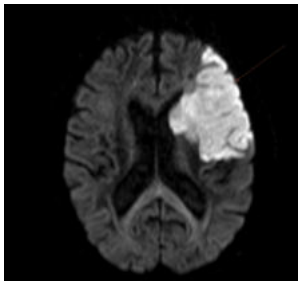

Fig 2.3: DWI image shows wedge shaped area of hyperintensity (diffusion restriction)

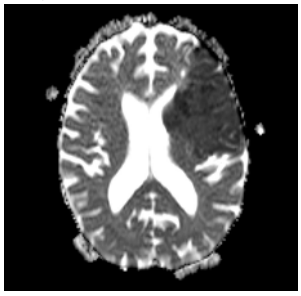

Fig 2.4 corresponding ADC show hypointensity (ADC value-0.534 x 10'3 mm'2/s)

Case 3

45 year old patient came to the emergency room with complaints of fever and body pain for 3 days. Right hemiparesis for past 12 hours. He had history of loose stools two days back. Vital signs on presentation were fever of 100.6 F, tachycardia with heart rate (HR) of 111 BPM, hypoxemia with saturation of 91% on 100% non-rebreathable mask. CT-thorax and MRI –Brain was done and following findings were found. CT Thorax-Bilateral lung fields show ground glass opacities with crazy paving pattern (Fig 3.1). MRI Brain- Diffusion restriction with corresponding ADC hypointensity noted involving left frontal grey and white matter, left external capsule and left insular cortex (Fig 3.2)

Fig 3.3: Corresponding ADC hypointensity

CASE 3 IMAGES

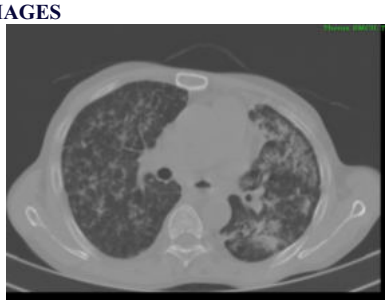

Fig 3.1: Bilateral lung fields show ground glass opacities with crazy paving pattern.

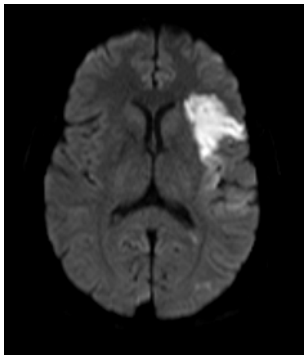

Fig 3.2: Diffusion restriction with corresponding ADC hypointensity noted involving left frontal grey and white matter, left external capsule and left insular cortex

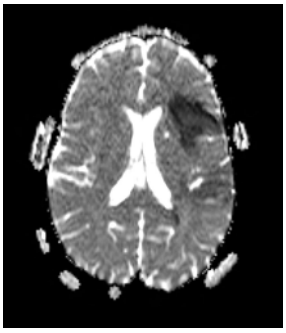

Fig 3.3: Corresponding ADC hypointensity

Clinical diagnosis: The clinician diagnosed it as RTPCR positive Covid 19.

Final diagnosis:
RTPCR-nCov detected.

DISCUSSION OF MANAGEMENT:
As our understanding of the coagulopathy associated with COVID-19 evolves, the best approach to management continues to be explored. Given the paucity of data in the pathophysiology of this disorder, physicians globally are compelled to prepare guidelines for management of this hypercoagulable state based on the established understanding of crosstalk between inflammation and thrombosis. Thus, clinicians are using prophylactic, intermediate, or therapeutic doses of anticoagulation, based on coagulation parameters and the clinical scenario.

Although the optimal dosing remains unclear the benefit of anticoagulation with heparin products (mostly LMWH at prophylactic doses) in COVID-19 patients was demonstrated by a study in China. Importantly, in the sub-group analysis, those with a sepsis-induced coagulopathy (SIC) score of greater than 3 (n = 97) had decreased 28-day mortality (40.0% vs 64.2%, P = 0.029), as did the 161 patients with D-dimer greater than 6 times the upper limited of normal (32.8% vs 52.4%, P = 0.017). Of concern, a Dutch study by Klok et al reported a 31% incidence of thrombotic complications that occurred despite the presence of at least prophylactic anticoagulation (with LMWH) in patients hospitalized for COVID-19 pneumonia

CONCLUSION:
In view of hyper-coagulability state induced by Covid-19, monitoring D-dimer, IL-6 and ferritin should be included as a part of routine investigations. In cases with altered values, prompt anticoagulation should be initiated to prevent vascular deficit to vital organs, thereby preventing devastating sequelae.

Anticoagulant in therapeutic doses of low-molecular-weight heparin (LMWH) in patients with covid 19 has been the routine practice. However the prophylactic dose

REFERENCES:

1) COVID-19 presenting as stroke Akshay Avula,a,⁎ Krishna Nalleballe,b Naureen Narula,a Steven Sapozhnikov,c Vasuki Dandu,b Sudhamshi Toom,d Allison Glaser,e and Dany Elsayegha
2) The hypercoagulable state in COVID-19: Incidence, pathophysiology, and management Mouhamed Yazan Abou-Ismail, Akiva Diamond, Sargam Kapoor, Yasmin Arafah, and Lalitha Nayak
3) Zhu N, Zhang D, Wang W et al. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med 2020 January 24 (Epub ahead of print), doi: 10.1056/ NEJ Moa2001017.
4) Salehi S, Abedi A, Balakrishnan S, Gholamrezanezhad A. Coronavirus Disease 2019 (COVID-19): A Systematic Review of Imaging Findings in 919 patients. AJR Am J Roentgenol. 2020;1–7
5) Shi H, Han X, Jiang N, et al. . Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. Lancet Infect Dis 2020; 20: 425-434
6) Ai T.Yang Z.Hou H.et al. Correlation of chest CT and RT-PCR testing in coronavirus disease 2019 (COVID-19) in China: a report of 1014 cases. Radiology. 2020;: 20064 2 https://doi.org/10.1148/radiol.2020200642
7) Management of acute ischemic stroke in patients with COVID-19 infection: Report of an international panel .Adnan I Qureshi1 , Foad Abd-Allah , Fahmi Al-Senani , Emrah Aytac , Afshin Borhani-Haghighi , Alfonso Ciccone , Camilo R Gomez7 , Erdem Gurkas , Chung Y Hsu , Vishal Jani, Liqun Jiao, Adam Kobayashi, Jun Lee, Jahanzeb Liaqat, Mikael Mazighi, Rajsrinivas Parthasarathy, Thorsten Steiner17, M Fareed K Suri18, Kazunori Toyoda19, Marc Ribo20, Fernando Gongora-Rivera, Jamary Oliveira-Filho, Guven Uzun and Yongjun Wang.