Artery of Percheron infarction associated with COVID-19 in the young adult

Aleksandar Pantovic¹ · Toplica Lepic² · Viktor Pasovski¹ · Zeljko Krsmanovic¹ · Ranko Raicevic²

Received: 10 February 2021 / Revised: 25 September 2021 / Accepted: 30 September 2021 / Published online: 4 November 2021
© Journal of NeuroVirology, Inc. 2021

Abstract

The artery of Percheron is a small vessel whose occlusion causes bilateral paramedian thalamic and rostral midbrain stroke. COVID-19 is an independent risk factor for acute small vessel ischemic stroke. We presented the case of a young adult patient with infarction in the artery of Percheron territory as a presenting feature of COVID-19. Artery of Percheron infarction is a neurodiagnostic challenge in emergency during COVID-19 pandemic.

Keywords Artery of percheron · COVID-19 · Young adult stroke

Introduction

The artery of Percheron (AOP) is an uncommon anatomic variant of the paramedian thalamus and rostral midbrain vascularization. The arterial trunk that arises from one side P1 segment of the posterior cerebral artery (PCA), bifurcates, and supplies blood to the paramedian thalamus and the rostral midbrain bilaterally (Lazzaro et al. 2010). Coronavirus disease 2019 (COVID-19) is caused by the novel Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Increased incidence of ischemic stroke is recognized in COVID-19 pandemic (Avula et al. 2020). The most common symptoms of AOP infarct include memory and speech impairment, alteration of consciousness, and ocular movement disorder (Lazzaro et al. 2010). The following is a case report of a 39-year-old patient with infarction in AOP territory as a presenting feature of COVID-19.

Case

A 39-year-old, right-handed man with no previous medical history presented to the emergency department with acute-onset of speech difficulties, somnolence, drooping of the

right upper lid, and right divergent squint. His neurologic examination was notable for disturbed consciousness presented as somnolence, severe dysarthria, and signs of third cranial nerve palsy on the right side. Examination of the pyramidal system was without any focal findings or pathologic reflex sign, and no papilledema was noted. He was afebrile with borderline systolic blood pressure, normal ECG, and arterial oxygen saturation of 98%. At the emergency department, blood count analyses and basic biochemical analyses, except creatine kinase 402 (30–300) U/L, were normal. Brain CT and CT angiography, chest radiography, on admission showed normal findings. SARS-CoV-2 IgM/IgG antibody fast detection test (AMP Rapid Test®) was negative. The day after admission to the intensive care unit brain MRI showed oval-shaped restricted diffusion in paramedian thalamus bilaterally and rostral midbrain on the left side that corresponds to an acute stroke (Fig. 1A, B). Due to the patient's decline in oxygen saturation SaO₂ 94% and fever, noted on the second day of hospitalization, chest radiography was repeated. X-ray imaging indicated bilateral symmetrical opacities in lower fields suspected of COVID-19 pneumonia. Increased level of serum creatine kinase 452 (30–300) U/L, CPR 75 (0–5) mg/dL, and D-dimer 3.1 (0–0.5) mg/L with normal leukocyte count were noted in parallel with a pneumonia diagnosis. Two-time repeated nasopharynx-swab RT-PCR test was negative for SARS-CoV-2. Extensive cardiac examination consisting of electrocardiogram, cardiac telemetry monitoring, echocardiography, carotid, vertebral arteries, and transcranial ultrasound were without pathological findings. Paraclinical

✉ Aleksandar Pantovic
alekpan82@yahoo.com

¹ Neurology Clinic, Military Medical Academy, Belgrade, Serbia

² Military Medical Academy, Faculty of Medicine, Neurology Clinic, University of Defence, Belgrade, Serbia

Fig. 1 Bilateral paramedian thalamus and the rostral midbrain infarction. Axial T2 FLAIR/DWI/ADC brain MRI showing (A) acute bilateral paramedian thalamic infarction, (B) left side rostral midbrain acute infarction 1 day after the first symptoms appeared. (C) Chronic bilateral paramedian thalamic infarction -1 year after first symptoms appeared (3 T MRI)

findings that include vasculitis panel tests, coagulopathy screen, HIV, hepatitis, malignancy screen, cerebrospinal fluid (CSF) analysis, and blood culture were done. The patient had 4G/4G homozygote polymorphism for plasminogen activator inhibitor-1 (PAI-1); the other specific analyses were normal or negative. In the context of the COVID-19 pandemic on the 10th hospitalization day, ELISA (WANTAI SARS-CoV-2 Ab) based IgM and IgG blood serum assay was done and the result was positive. After admission to the hospital, the patient was on continuous monitoring for ECG, oxygen saturation, blood pressure, body temperature, and diuresis. The treatment has been started with enoxaparin 40 mg sc/24 h and 0.9% saline. The next day, after the diagnosis of pneumonia, treatment was continued with added methylprednisolone 1 mg/kg 3 days, azithromycin in a single daily dose of 500 mg 7 days, alfacalcidol (Alpha D3) 1 × 2 mcg, and vitamin C 1 × 2 g. Patient saturation and CRP have been normalized on the 10th day, chest radiography was repeated on the 12th hospitalization day showing high-grade resolution of previously noted bilateral symmetrical opacities in lower fields. Enoxaparin treatment was prolonged and replaced with aspirin.

The patient's neurological findings evolved with a lesser degree of somnolence, residual oculomotor dysfunction, and anterograde amnesia. He was verticalized, and his speech was recovered. At the control visit after a year, the only residual finding was a low degree of oculomotor

dysfunction as a consequence of damage to the third nerve motor nucleus in the rostral mesencephalon. The neuropsychological assessment showed normal test results; the patient has an active lifestyle. Follow-up MRI after 1 year detected residual chronic stroke without new vascular lesions (Fig. 1C).

Discussion

AOP occlusion is radiologically presented as bilateral paramedian thalamic infarct with variable midbrain involvement. Estimated AOP infarct occurrence is 0.1 to 0.3% of all stroke patients and may account for up to 20% of thalamic strokes (Lazzaro et al. 2010). The exact prevalence of AOP anatomic variant is not known; it is estimated to occur in up to 33% of the population (Uz, 2007). Increased incidence of ischemic stroke is recognized in COVID-19. Furthermore, SARS-CoV-2 infection can be presented with a cerebrovascular accident as the first clinical manifestation as in our case (Avula et al. 2020). AOP occlusion is a neurodiagnostic challenge in emergency context if the center does not have an MRI available for acute neurological conditions. AOP is rarely visualized by angiography due to its small vessel size (Lamot et al. 2015). In our case, brain MRI findings suggestive for diagnosis were obtained the day after admission. Our patient has no previous medical history. Only, but

controversial detected risk factor for the ischemic accident is 4G/4G PAI-1 polymorphism. According to IgM/IgG time dynamic detection, patient age, undetected any other clear stroke risk factor, and radiological findings suggestive of COVID-19 pneumonia at the second day of hospitalization, we conclude that the ischemic accident was due to SARS-CoV-2 infection. Serological testing may be helpful for the diagnosis of COVID-19 suspected patients with negative or false-negative PCR tests (Long et al. 2020) as in the case we reported.

In the reported case, SARS-CoV-2 IgM/IgG-positive patient presented with a condition that clinically and radiologically corresponds with AOP infarction as the first manifestation of COVID-19. Small vessel size stroke as AOP is a neurodiagnostic challenge in emergency context during the COVID-19 era. Acute onset, even rare small vessel stroke syndromes in a young patient, should be considered presenting manifestation of SARS-CoV-2 infection during the COVID-19 era.

Declarations

Aleksandar Pantovic reports no disclosures, Toplica Lepic reports no disclosures, Viktor Pasovski reports no disclosures, Zeljko Krsmanovic reports no disclosures, Ranko Ricevic reports no disclosures.

References

- Avula A, Nalleballe K, Narula N, Sapozhnikov S, Dandu V, Toom S, Glaser A, Elsayegh D (2020) COVID-19 presenting as stroke. *Brain Behav Immun* 87:115–119. <https://doi.org/10.1016/j.bbi.2020.04.077>
- Lamot U, Ribaric I, Popovic KS (2015) Artery of Percheron infarction: review of literature with a case report. *Radiol Oncol*. <https://doi.org/10.2478/raon-2014-0037>
- Lazzaro NA, Wright B, Castillo M, Fischbein NJ, Glastonbury CM, Hildenbrand PG, Wiggins RH, Quigley EP, Osborn AG (2010) Artery of percheron infarction: Imaging patterns and clinical spectrum. *Am J Neuroradiol*. <https://doi.org/10.3174/ajnr.A2044>
- Long QX, Liu BZ, Deng HJ, Wu GC, Deng K, Chen YK, Liao P, Qiu JF, Lin Y, Cai XF, Wang DQ, Hu Y, Ren JH, Tang N, Xu YY, Yu LH, Mo Z, Gong F, Zhang XL, Tian WG, Hu L, Zhang XX, Xiang JL, Du HX, Liu HW, Lang CH, Luo XH, Wu SB, Cui XP, Zhou Z, Zhu MM, Wang J, Xue CJ, Li XF, Wang L, Li ZJ, Wang K, Niu CC, Yang QJ, Tang XJ, Zhang Y, Liu XM, Li JJ, Zhang DC, Zhang F, Liu P, Yuan J, Li Q, Hu JL, Chen J, Huang AL (2020) Antibody responses to SARS-CoV-2 in patients with COVID-19. *Nat Med* 26:845–848. <https://doi.org/10.1038/s41591-020-0897-1>
- Uz A (2007) Variations in the origin of the thalamoperforating arteries. *J Clin Neurosci* 14:134–137. <https://doi.org/10.1016/j.jocn.2006.01.047>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.