Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Journal of Neuroradiology 47 (2020) 395–396

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Acute ischemic stroke complicating common carotid artery thrombosis during a severe COVID-19 infection

Factor associated with outcomes and mortality in COVID-19 patients includes cardiovascular and cerebrovascular comorbidities but the underlying mechanisms are still hypothetical [1]. We report the case of a 73-year-old patient who developed within a week after the onset of respiratory symptoms related to SARS-CoV2 infection, an acute ischemic stroke (AIS) complicating a large floating thrombus within the common carotid artery. The patient has no specific past medical history, no treatment and no vascular risk factors. He presented at the emergency department on March 25th for the onset of fever and dry cough. Clinical evaluation was reassuring and the patient was discharged home. He was readmitted 7 days later for the acute onset of aphasia and right hemiparesis evolving for 9 hours. On admission, the patient was in respiratory distress, and neurological examination revealed a left middle cerebral artery (MCA) syndrome with a NIH stroke scale (NIHSS) of 10. Chest CT showed ground glass opacities typically reported in SARS-CoV2 infection, which was subsequently confirmed by real-time reverse transcriptase–polymerase chain reaction assay on a nasopharyngeal swab sample. Brain Computer Tomography (CT), CT angiography (CTA) and CT perfusion, performed on a 64-channel scanner (Optima, General Electric, USA), showed subtle cortical left frontal hypoattenuation with more extended surrounding hypoperfusion and distal occlusion of branch (Fig. 1). CT perfusion was acquired before CTA, and both were performed using, for each, a 40 cc-bolus of iodine contrast injected at a 5 cc/sec rate (iobitridol 350, Guerbet, France), pushed by 40 cc of physiological serum. Cervical CTA also revealed a large intraluminal floating thrombus appended to a hypoattenuated non-stenosing plaque of the left common carotid artery wall. Dedicated wall imaging with 3 T MRI (Skyra, Siemens, Germany) and Doppler ultrasoonography confirmed the diagnosis of a large thrombus adherent to a thin atheromatous plaque. Of note, those examination disclosed no ulceration, plaque hemorrhage or circumferential gadolinium enhancement of the wall potentially suggestive of arteritis. Diffusion-Weighted Imaging performed 2 days later confirmed the diagnosis of multiple AIS with foci of hyperintensity scattered within left carotid territory. Blood tests results showed lymphopenia (0.5×10^9 cells per L), inflammatory syndrome with elevated C-reactive protein (219 mg/L), ferritin (1096 microg/mL) and fibrinogen (8.2 g/L), and coagulation activation with elevated D-dimer (2220 ng/mL). Platelets were normal. Antiphospholipid antibodies were negative. EKG was in sinus rhythm. As the symptoms had been evolving for more than 9 hours and there was no proximal large vessel occlusion, we did not propose a revascularization treatment. The patient was transferred to medical ICU where high flow nasal cannula oxygen therapy and anticoagulation by subcutaneous low molecular weight heparin (enoxaparin b.i.d.) were started. His respiratory status improved, no recurrent emboli occurred and the thrombus has disappeared on follow up ultrasound examination performed 15 days after stroke onset. The patient was transferred to neurological ward on April 10th and discharged 7 days later. Neurological exam at discharge found a persistent moderate aphasia (NIHSS = 3).

To the best of our knowledge, this is the first case of acute brain infarction due to common carotid artery thrombus in the course of a severe COVID-19 infection. In non COVID-19 stroke patients, intraluminal floating thrombi of the cervical arteries are rare and usually occur on ulcerated plaques or plaques with stenosis > 50% of the internal carotid artery [2]. It is even more unusual on non-atheromatous and non-dissecting processes of the cervical arteries [3]. Here, this soft and smooth hypodense plaque underlying the thrombus was non-ulcerated, non-stenosing and was located on the common carotid artery. Such a location is exceptional and represents 1% of all intraluminal thrombi in the cervico-cephalic arteries responsible of stroke [2]. In a Covid-19 cohort of 226 patients, neurologic manifestations have been reported in 36% with 5 patients experiencing acute ischemic strokes. If the origin and precise mechanism of the strokes were not described, all patients but one were in the severe infection group with elevated D-dimer and C-reactive protein, accounting for 4% of this group [4]. Three cases from another study have been associated with antiphospholipid antibodies, which were negative in our case report [5]. More generally, one of the most significant poor prognostic features in the hospitalized COVID-19 patient is the development of a coagulopathy leading, for some of them, to multiple organ dysfunctions [6]. We speculate that this large floating intraluminal thrombus, occurring at an unusual site, was primarily due to heightened thrombotic proclivity, as evidenced by significantly elevated D-dimer level, but we cannot exclude a direct role of Covid-19 infection on atheromatous plaque stability [7].

In summary, this case illustrates that source of stroke should be sought by cervical CTA covering from the aortic arch to the vertex, without overlooking common carotid arteries and emphasized the need for COVID-19 coagulopathy management [8].

https://doi.org/10.1016/j.neurad.2020.04.003

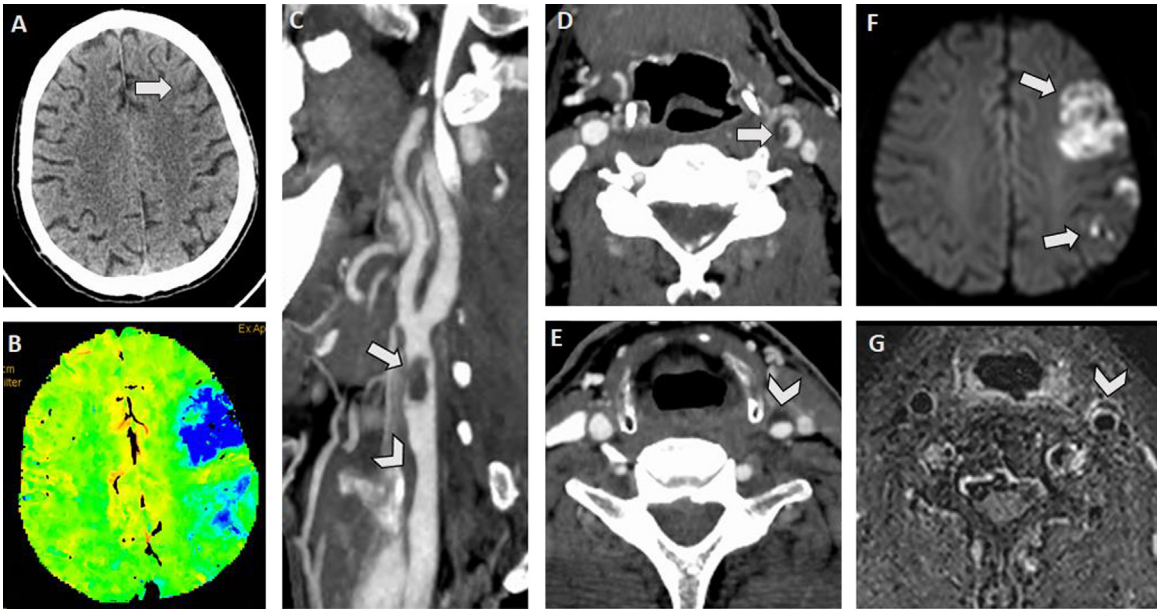

Fig. 1. 66-year-old patient with COVID-19 lung infection and acute stroke. A. Axial head CT performed 9 hours after symptoms onset barely depicts left frontal cortical hypoattenuation (arrow). B. Perfusion CT reveals larger area of hypoperfusion (in blue). C-E. CT angiography demonstrates large floating intraluminal thrombus in the distal left common carotid artery (arrows on C and D) adherent to a non-stenosing hypoattenuated plaque (arrowheads on C and E). F. Axial Diffusion-Weighted image shows multiple ischemic lesions in the left hemisphere. G. MRI wall imaging with gadolinium-enhanced axial black-blood SPACE T1-weighted image with fat saturation reveals peripheral enhancement of the plaque only, without circumferential thickening of the common carotid artery.

Disclosure of interest

JMO modest consulting: Aptoll, Abbvie, Bristol Myers Squibb, Medtronic.

The other authors declare that they have no competing interest.

References

[1]. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*. 2020;395:1054–1062.
[2]. Singh R, Chakraborty D, Dey S, et al. Intraluminal Thrombi in the Cervico-Cephalic Arteries. Clinical-Imaging Manifestations, Treatment Strategies, and Outcome. *Stroke*. 2019;50:357–364.
[3]. Benson J, Lehman T, Carr C, et al. Beyond plaque: A pictorial review of non-atherosclerotic abnormalities of extracranial carotid arteries. *Journal of Neuroradiology*. 2020 [Epub ahead of print].
[4]. Mao L, Jin H, Wang M, et al. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China. 2020. *JAMA Neurol*. 2020 [Epub].
[5]. Zhang Y, Xiao M, Zhang S, et al. Coagulopathy and Antiphospholipid Antibodies in Patients with Covid-19. *N Engl J Med*. 2020 [Epub].
[6]. Tang N, Li D, Wang X, Sun Z. Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia. *J Thromb Haemost*. 2020 [Epub].
[7]. Madjid M, Safavi-Naeini P, Solomon S, Vardeny O. Potential Effects of Coronaviruses on the Cardiovascular System: A Review. *JAMA Cardiol*. 2020 [Epub].
[8]. Terpos E, Ntanasis-Stathopoulos I, Elalamy I, et al. Hematological findings and complications of COVID-19. *Am J Hematol*. 2020 [Epub].

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Available online 4 May 2020