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LETTER TO THE EDITORS

Isolated post SARS-CoV-2 diplopia

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Dear sirs,

On March 31, 2020, a 21-year-old man presented to Avicenne Hospital with a 3-day history of cough, dyspnea, and fever. His body temperature was 38.1 °C, his respiratory rate was 28 breaths/min and the oxygen saturation was 97% on ambient air. A chest computed tomography (CT) showed lingula and left base bronchopneumopathy and was classified as moderate damage of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The real-time polymerase-chain-reaction (PCR) nasal testing returned positive for SARS-CoV-2. Regarding the initial hypercapnic decompensation, a non-invasive ventilation was used, and he was treated by Cefotaxime, Rovamycine and Hydroxychloroquine. Secondary worsening of his respiratory condition led to orotracheal intubation and referral in intensive care unit for 6 days. There was no evidence for pulmonary embolism, and the patient, whose body mass index was over 40 kg. m^{-2}, received preventive anticoagulation with low molecular weight heparin twice per day. He finally left the hospital on April 14th.

On April 15th, the patient came back for a binocular horizontal diplopia which began 48 h before, with a quick installation mode, without blurred vision nor red or painful eyes. There was no clinical variation of his symptomatology, no headache, no fever and no respiratory symptoms. He had no medical history of strabismus or ametropia, he had no cardiovascular risk factor, apart from obesity. Oculomotor examination showed a strabismus with a constant exotropia of the left eye in primary position (Fig. 1a) and normal pupillary light reflex. There were no ptosis, no Horner's syndrome, no cerebellar syndrome and no exercise-induced fatigability. The rest of the examination only showed vivid and diffused osteotendinous reflexes, with bilateral Hoffmann sign. The Hess-Lancaster test evidenced the partial left third cranial nerve palsy (Fig. 1b). Brain MRI showed several arterial micro-ectasia (Fig. 1c), but no parenchymal abnormalities or meningeal contrast enhancement and no sign of ocular myositis. Exhaustive blood analyses did not show any viral (HIV infection or Lyme's disease), auto-immune (antinuclear antibodies, anti-dsDNA antibodies, anti-MOG antibodies, anti-AQP4 antibodies) or paraneoplastic abnormalities (blood and CSF anti neural antibodies). There was no evidence of syphilitic infection, nor of hemostasis disorder, in particular no argument for antiphospholipid syndrome. The search of diabetes mellitus and dyslipidemic disorders was negative. Cerebrospinal fluid analyses revealed no white-cell, normal protein levels, no intrathecal synthesis and negative PCR SARS-CoV-2. From the 7th day, the patient rapidly recovered from his diplopia.

Therefore, the patient presented a partial acute extrinsic paralysis of the left third cranial nerve, spontaneously resolving in 7 days following a severe form of SARS-CoV-2. To our knowledge, third cranial nerve palsy has already been described with some viruses, suggesting some hypotheses [1–4]. SARS-CoV-2 is a neurotrophic virus that can induce encephalitis. In this condition, a slight elevated intracranial pressure could result in isolated ocular motor paresis, usually affecting the sixth cranial nerve rather than the third one. Here, clinical examination and biological explorations did not support inflammatory and meningeal origins. Third cranial nerve compression was ruled out by brain MRI and also by rapid spontaneous recovery. A thrombotic etiology was another hypothesis since SARS-Cov-2 may favor thrombotic disease in venous and arterial circulations [5].

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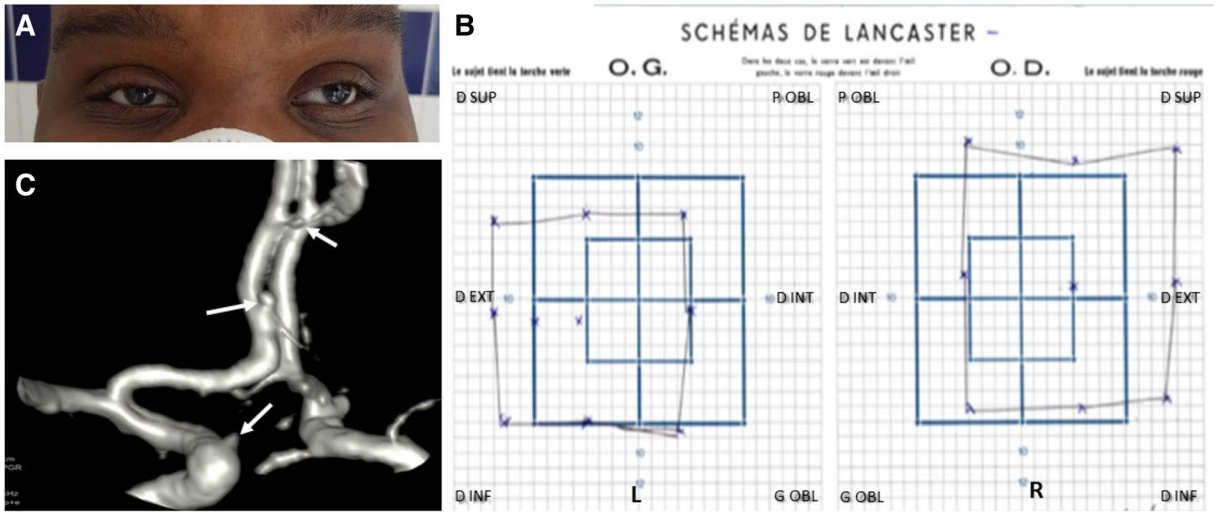

Fig. 1 Isolated left third cranial nerve palsy. **a** Exotropia of the patient's left eye in primary position; **b** Hess-Lancaster test. Deficit of the right medial and upper ocular motor muscles of the left eye, associated with compensatory hyperaction of the contralateral agonist muscles of the right eye; **c** 3D reconstruction of the front part of the Willis polygon that shows several arterial micro-ectasia (white arrows). *L* left eye, *R* right eye, *D. SUP.* superior rectus muscle, *D. EXT.* lateral rectus muscle, *D. INF.* inferior rectus muscle, *D. INT.* medial rectus muscle, *P. OBL.* superior oblique muscle, *G. OBL.* inferior oblique muscle

Indeed, a microvascular ischemic etiology could be involved in our patient presenting with overweight and several arterial micro-ectasia on brain MRI. SARS-Cov-2-related third cranial nerve palsy should be a diagnosis of exclusion but physicians should be aware of possible ocular motor dysfunction.

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Compliance with ethical standards

Conflicts of interest Authors declare no competing interests.

Ethical standard statement A written informed consent form was obtained from the patient and this case report fulfilled the Ethical standards.

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