

# Vascular encephalopathy demonstrated by brain single-photon emission computed tomography (SPECT-CT scan) in Long Covid patients

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## **Abstract**

Brain single-photon emission computed tomography (SPECT-CT scanning) has been used in fourteen Long Covid patients seen in family practice with severe neurocognitive problems. Vascular encephalopathy has been demonstrated in each patient and supports the hypothesis of a persistent coagulation disorder in Long Covid.

## **Keywords**

Long Covid; General Practice; Single Photon Emission Computed Tomography (SPECT CT scan); Hypoxia, Brain

## **Funding information**

Not funded

## **Ethics**

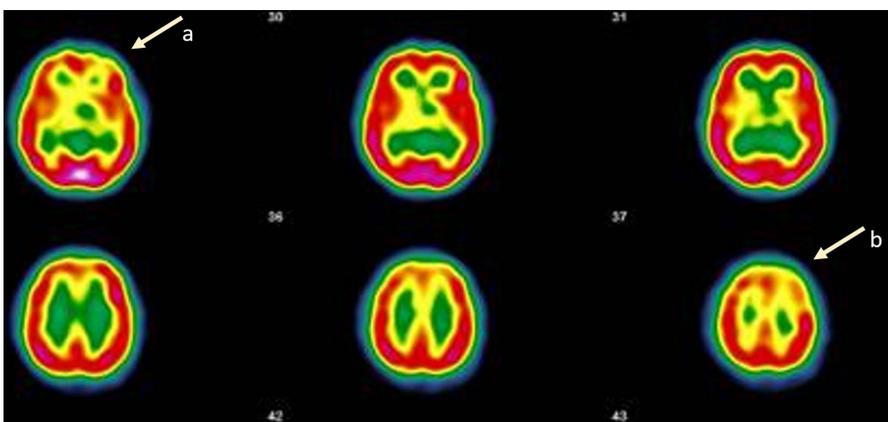
The patient whose imaging is shown in Fig 1 has expressly agreed in writing to the use of her personal data in an anonymous manner. The ethics committee of the University Hospital of Liege, Belgium, gave its full approval to this study under the number 2022/23.

To the Editor:

In “*Addressing Post-COVID Symptoms: A Guide for Primary Care Physicians*”<sup>1</sup> the authors present an excellent post-COVID management tool to use as a quick reference and guide for the initial workup and therapeutic support of patients. Indeed Long Covid is a multi-system disease, sometimes occurring after a relatively mild illness. It encompasses distinct clusters of heterogeneous symptoms that can overlap and evolve over time, and are sometimes difficult to relate to Covid-19.

Between July 2021 and February 2022, clinical symptoms of 34 cases (mean age 40, 25 women) of Long Covid have been observed in Family Practice (Belgium) and described in a clinical research report.<sup>2</sup> The combination of previously unknown irrepressible fatigue, exhaustion on exertion, brain fog, memory impairment with anomia, sometimes anosmia or others symptoms are characteristic of Long Covid. The high proportion of women suggests a type of autoimmune disease. All but two patients were vaccinated well after becoming ill.

The combination of cognitive symptoms in those patients suggested a neural impairment. A hypo-metabolism of certain brain areas in some Long Covid with a strong neurological component had already been demonstrated by PET Scan.<sup>3</sup> Brain single-photon emission computed tomography (SPECT CT scan) is cheaper and more accessible in Primary care than PET Scan. Brain SPECT CT scan has been used to show a disorder of cerebral blood perfusion in Alzheimer’s disease or stroke and therefore may help in detecting cerebral pathology in Long Covid.



**Fig. 1** Patient MB, F, 48. Long Covid persisting 9 months since acute illness with brain fog, abnormal dreams, depressive feeling, irrepressible fatigue, poor exercise tolerance. The brain SPECT CT scan shows hypofixation of the tracer in left cortico-frontal (a) and left fronto-parietal (b) areas. (Courtesy Drs Bouazza & Mahy, Vesale hospital, ISPPC, Belgium)

The fourteen patients for whom a brain SPECT CT scan was requested had signs of brain impairment including three or more of the following symptoms; huge tiredness, exercise intolerance, cognitive problems such as brain fog, memory loss, anomia, headache, dysphasia, anosmia, dysgeusia, dysesthesia. Their DUSOI/WONCA severity index was high or maximum and their WONCA COOP charts score was over 20, meaning severe functional loss. Unexpectedly, brain SPECT showed severe alterations in cerebral blood flow in all patients, both cortical and central.

All the lesions observed by brain SPECT CT scan are similar in all cases to those shown in Fig 1. This supports the hypothesis of a vascular perfusion disorder and localized brain ischemia secondary to a unexplained process like a coagulation disorder and/or the presence of auto-antibodies<sup>4</sup> and could guide a therapeutic approach. It should be noted that fatigue and exhaustion during exercise can result from a difficult extraction of oxygen from the lungs, probably due also to vascular flow impairment.<sup>5</sup>

In the next step, the patients will benefit from the Long Covid program of the COVID Human Genetic Effort (<https://www.covidhge.com/>), an international consortium aiming to discover the human genetic and immunological bases of the various clinical forms of SARS-CoV-2 infection and in particular the characteristics of Long Covid patients. This will remove the diagnostic uncertainty for patients without PCR testing or those with negative serological tests (14/34 cases in this series). Indeed the uncertainty of the biological diagnosis can have psychological, medico-legal and clinical consequences.

Vascular encephalopathy has been demonstrated in every patient and supports the hypothesis of a long-lasting intravascular clotting in Long Covid. It is necessary to test the reproducibility of this description, conducted on a small number of patient. Nevertheless family doctors have considerable collective resources in epidemiological research and must act now.<sup>6</sup>

## References

- <sup>1</sup> Vance, H., Maslach, A., Stoneman, E., Harmes, K., Ransom, A., Seagly, K., Furst, W.: Addressing post-covid symptoms: A guide for primary care physicians. *Journal of the American Board of Family Medicine: JABFM* **34**(6), 1229–1242 (2021). <https://doi.org/10.3122/jabfm.2021.06.210254>
- <sup>2</sup> Jamouille, M., Kazeneza-Mugashi, G., Ayoub, Z.: Descriptive and narrative study of long covid cases in general practice and diagnostic value of single photon emission computed tomography, clinical research report. Technical report, Department of General practice, University of Liège, Belgium (2022). <https://orbi.uliege.be/handle/2268/265876>

- <sup>3</sup> Guedj, E., Million, M., Dudouet, P., Tissot-Dupont, H., Bregeon, F., Cammilleri, S., Raoult, D.: 18 f-fdg brain pet hypometabolism in post-sars-cov-2 infection: substrate for persistent/delayed disorders? *European journal of nuclear medicine and molecular imaging* **48**(2), 592–595 (2021). <https://doi.org/10.1007/s00259-020-04973-x>
- <sup>4</sup> Grobbelaar, L.M., Venter, C., Vlok, M., Ngoepe, M., Laubscher, G.J., Lourens, P.J., Steenkamp, J., Kell, D.B., Pretorius, E.: Sars-cov-2 spike protein s1 induces fibrin (ogen) resistant to fibrinolysis: Implications for microclot formation in covid-19. *Bioscience reports* **41**(8) (2021). <https://doi.org/10.1042/BSR20210611>
- <sup>5</sup> Singh, I., Joseph, P., Heerdt, P.M., Cullinan, M., Lutchmansingh, D.D., Gulati, M., Possick, J.D., Systrom, D.M., Waxman, A.B.: Persistent exertional intolerance after covid-19: insights from invasive cardiopulmonary exercise testing. *Chest* **161**(1), 54–63 (2022). <https://doi.org/10.1016/j.chest.2021.08.010>
- <sup>6</sup> Alwan, N.A., Burgess, R.A., Ashworth, S., Beale, R., Bhadelia, N., Bogaert, D., Dowd, J., Eckerle, I., Goldman, L.R., Greenhalgh, T., *et al.*: Scientific consensus on the covid-19 pandemic: we need to act now. *The Lancet* **396**(10260), 71–72 (2020). [https://doi.org/10.1016/S0140-6736\(20\)32153-X](https://doi.org/10.1016/S0140-6736(20)32153-X)