

## CLINICAL VIGNETTE

# Transcranial Magnetic Stimulation for COVID-19 “Brain Fog”

Jeanette Ilarde, MD

This is a case of transcranial magnetic stimulation (TCM) therapy for “brain fog” post-COVID. Brain fog is not a medical or scientific term but has been described in multiple ways such as sluggish thinking, lack of concentration, poor memory, fuzzy thinking and loss of attention.

A 54-year-old female has Attention Deficit Disorder (ADD) since age 26 with anxiety and depression. She also has HTN, Obesity, and Thyroid nodules. She does not smoke or drink alcohol. She has no history of recreational drug use. Her work involved analyzing financial data.

She has been seeing a psychiatrist and therapist for several years and had been on long-term drug therapy for anxiety and depression. At the time of her COVID illness she had been stable for years, she was taking daily bupropion SR 200 mg, escitalopram 10 mg, fluoxetine 20 mg, zolpidem 10 mg as well as lorazepam 1mg, as needed.

She was diagnosed with COVID with a fever of 102°F and symptoms included cough, nasal congestion, and “horrible headaches”. She had no shortness of breath or gastrointestinal symptoms. She was treated with nirmatrelvir/ritonavir combination and completed the standard 5-day course without problems. After treatment, she had persistent symptoms. She described physical fatigue so severe that she could not stand up in the bathroom to take showers and she felt the need to sleep all the time for several days. Her most bothersome complaint was brain fog. She described this as mental fatigue and failing to remember street names and names of people that she knew. Although she remained foggy, she resumed work 15 days after onset of illness.

Laboratory tests included mild anemia with hemoglobin of 10.8 and normal WBC. Iron level was low and Ferritin were low at 27 and Folate, B12, TSH, Complete metabolic panel were normal. She was started on iron supplementation.

Due to her persistent brain fog, transcranial magnetic stimulation (TMS) was recommended by her psychiatrist. Her GAD-7 questionnaire had a baseline score of 19.

She started therapy sessions two months after the onset of COVID illness and completed a total of 36 sessions, with initial sessions of 30 to 45 minutes and eventually tapering down to 5 minutes over 6 weeks. She noticed gradual major improvement

of her brain fog symptoms and repeat GAD-7 score was 0 at 8 weeks.

### Discussion

COVID symptoms can persist for several months after the acute illness. The range of symptoms after acute illness can be broad - both physical and mental and are not related to active viral infection and infectivity. Studies on the persistent symptoms have been limited by methodologies, selection and reporting bias, and lack of standard assessments.<sup>1</sup> Symptoms include fatigue, dyspnea, concentration and memory impairment, headache, chest discomfort, and anxiety. A meta-analysis of neurologic and neuropsychiatric manifestations of post-COVID-19 syndrome reported 32% prevalence of brain fog 32%, memory issues 28%, attention disorder 22%, sleep disturbances 31%, anxiety 23% and depression 17%.<sup>2</sup>

The neurologic basis for cognitive deficits and fatigue post-COVID is still not fully understood. They may involve a combination of factors including neuroinflammation, immune system dysfunction, and dysregulation of the autonomic nervous system.<sup>3</sup>

Effective treatments for long COVID are still limited and not adequately understood. Depending on the symptoms, basic measures such as supportive treatment with rest, exercise and a gradual return to work schedule are recommended. A pilot study on transcranial magnetic stimulation for neuropsychiatric symptoms with long-COVID in 23 patients was reported in Japan.<sup>4</sup> This included COVID-19 infected patients based on: 1) positive polymerase chain reaction (PCR) test result and who were negative for coronary infection at the time of psychiatric consultation; 2) patients who developed a condition that met the diagnostic criteria for depression or anxiety disorder in the DSM-5 for the first time after COVID-19 infection; and 3) patients with a severity score of 12 or higher on the Montgomery-Åsberg Depression Rating Scale (MADRS). The study reported significant improvement in objective depression symptoms, mild improvement in chronic fatigue, and significant improvements in subjective cognitive impairment represented by brain fog. They confirmed a certain level of safety and tolerability as well.

Case reports have shown effectiveness of noninvasive brain stimulation on long COVID. Transcranial direct current stimulation (tDCS) was used on 2 patients referred by their neurolo-

gists that improved after remotely supervised tDCS. The first patient had fatigue, cognitive impairment, anxiety and depression, sleep disturbances and numbness sensation on the right side of the face nine months after COVID-19 illness. She received 20 repetitive frontal tDCS stimulations over 4 weeks. The authors developed an assessment tool, Assessment of Post-Acute Sequelae of SARS-CoV-2 (A-PASC). The patient reported a clinically significant improvement in cognitive performance, fatigue, and depression using A-PASC. The second patient presented with “brain fog” and fatigue seven months following COVID illness and recent tDCS treatment. The patient’s self-evaluation with the A-PASC inventory seven months later showed significant improvements across physical, cognitive, emotional, and functional areas.<sup>5</sup> Another case report also showed improvement after tDCS. This patient developed fatigue and phobia 4 weeks after acute illness and received daily 20-minute sessions over 20 days. He reported experiencing less anxiety and better physical and cognitive performance post treatment assessment.<sup>6</sup>

### Conclusion

Our case shows how TMS helped in treatment of cognitive dysfunction. Post-COVID symptoms need to be studied further and better defined. The current treatments of supportive care and cognitive behavioral therapy are limited. We need to keep open options to medical and non-medical treatment that may help patients resume their previous activities and return to work as soon as possible.

### REFERENCES

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