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Case-Report

Combination of TPS and TMS in a patient with post-COVID-19 depression

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Abstract

Treatment with TMS (transcranial magnetic stimulation) was initiated in a 76-year-old patient with a moderate stage depressive episode with an anxious component (BDI-II: 24; BAI: 29) after a COVID-19 infection. After 30 sessions, the anxious component improved substantially (BAI: 16), but not the depressive mood. When changing the procedure to TPS (transcranial pulse stimulation), there was a clear improvement in mood after the 3rd session; and after the 6th session, there was almost complete remission of the depression (BDI-II: 2; BAI: 12). This case observation could be a first indication of synergistic effects or the reasonable combination of both methods in depressed patients, especially in a combination with vegetative hyperarousal.

Introduction

The patient (76a, retired electrician, married, two children) presented himself to the Department of Psychiatry and Psychotherapy at the Schaffhausen Hospital with a depressive-anxious syndrome that had existed for a year and a half. The patient has had recurrent depressive episodes, some with suicidal thoughts, since 1993. There have been two suicides in the extended family so far. One son is manic-depressive sick and his sister suffers from paranoia.

The cause of the current episode was a COVID-19 infection in October 2020. Mental symptoms showed: low spirits, loss of interest, social withdrawal, rapid exhaustion (after emptying the dishwasher, "I just lay in bed for months"), problems with concentration and memory, lack of drive, tinnitus, early awakening and severe anxiety, headaches, constipation and diarrhea. Systemic and inflammatory symptoms since the COVID-19 infection: asthma with restricted lung function, shortness of breath, chest pain, tachycardia, muscle and bone pain.

The latest medication was up to 150 mg of Nortriptyline, which, however, had little effect in the current phase, but caused dry mouth, as well as lithium carbonate 625 mg, which together with nortriptyline caused tremor and therefore could not be dosed any higher.

Due to the resistance to antidepressive therapy, it now made sense to use methods from the field of interventional psychiatry, especially since it has already been seen that TMS can be successful in treatment of depression but also in post-COVID-19 fatigue (1). It has also been shown, that TPS can be successful in Alzheimer's patients with depression (2). Our hypothesis was that TPS is also effective in depression without dementia and, analogous to TMS, activates the DMN (default mode network) by stimulating the DLPFC (dorsolateral prefrontal cortex).

Material and methods

Therapy was started with TMS (1 Hz, 100% MT, 1500 stimuli, stimulation site P8, 30 min per session, 3 times a week, round coil, Mag Pro R30 device) with a vagotonic protocol. The treatment was monitored with a pulse oximeter. When the correct stimulation site was found and the corresponding cortical network responded by giving impulses to the hypothesized vagotonic centre(s) in the deeper structures of the brain, an immediate reduction in heart rate was observed. This patient had a pulse reduction of up to 32 beats to a normal range of 64 beats per minute, which was thus interpreted as an indication of the activation of the vagotonic centre(s).

During treatment with TMS, the results with regard to anxiety symptoms were satisfactory (BAI: 16), but not with regard to depressive symptoms (continued BDI-II: 24), so that TPS was started. We placed the probe over the left DLPFC (F3) and used a protocol almost identical to the current protocol for stimulation in demented patients (0.15mJ/mm2, 4 Hz, 6000 pulses, 6 sessions 1-2 days apart, Device: Neurolith) (3,4).

TMS (Magventure, Mag Pro)

TPS (Storz, Neurolith)

Results

Towards the end of the series with TMS, the patient felt clearly calmer and less anxious, early awakening had also improved somewhat. The BAI score dropped from 29 (severe anxiety) to 16 points (moderate anxiety). However, the remaining depressive symptoms remained unchanged (BDI-II: 24 points: moderate depression). During treatment with TMS, the systemic, respectively inflammatory abdominal and respiratory symptoms improved significantly: the patient had no more asthma attacks, only shortness of breath on exertion, no more chest pain and no more muscle or joint pain.

In order to treat the depressive symptoms, we decided on a series of treatments with TPS. After the 3rd session with TPS, "suddenly life came back". After the 6th session, the patient was so satisfied overall (BDI-II: 2 points, BAI: 12 points) that we jointly decided to stop the treatment.

6 weeks after the end of the treatment, the patient reports an overall significantly improved drive. He now cycles up to 90 km a day. His mood has improved significantly. He is humorous and funny again. His wife describes him as "naughty" again. In the morning he has energy, has started social contacts again ("now I'm back from the bush"). His weight has increased slightly. The BDI-II had risen marginally by 2 points (therefore still no indication of depression) and the BAI also by 2 points (still slight intensity of anxiety). He still complains about waking up early. Nortriptyline has since been reduced to 25mg and lithium carbonate to 450mg.

Discussion

In the case of the patient described here, the anxiety component improved by the vagotone TMS protocol. It is unclear whether this is a network activation by superficial cortical structures or a direct influence on deeper structures such as the nuclei dorsales nervi vagi. It is also unclear whether this is a sympathicolytic or parasympathomimetic effect (5) In the context of this vagotonic reaction, possible influences on the immune system cannot be ruled out, which ultimately alleviate the cytokine-related COVID-19 effects (respiratory problems, muscle and bone pain) (6).

In the subsequent TPS protocol, we used the usual treatment for dementia of the Alzheimer's type, but reduced the dose somewhat in order to increase tolerability in return.

The combination of TPS and TMS is interesting in itself because there are indications of common mechanisms of action for both methods (improvement of neuroplasticity through the release of BDNF (7,8) and differentiation of stem cells (9,10)).

Conclusion

As far as we know, our case report is about the first successful combination of both methods and the first successful treatment with TPS in a non-demented depressive patient with an anxiety component. The successful combination of TMS and TPS in patients with moderate depression, encourages further research in this area.

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