Transcranial Direct Current Stimulation (tDCS) replaces Electroconvulsive Therapy (ECT) in a Patient with Corpus Callosum Agenesis and Catatonic Schizophrenia

Transcranial direct current stimulation (tDCS), a non-invasive brain stimulation technique, was found to exert therapeutic effects in both schizophrenia patients with auditory hallucinations and a single case of catatonic schizophrenia.

Methods

The 42-year-old male patient with known complete CCA (see Figure 1) had shown severe catatonic symptoms since adolescence and had been treated with weekly electroconvulsive therapy (ECT) for almost six years, because drug treatment was ineffective (3). ECT was discontinued after the patient experienced a third degree atrioventricular block and cognitive deterioration. After obtaining approval from the local ethics committee and informed consent from the patient and his relatives, tDCS was started with the following stimulation settings: Anode over the left dorsolateral prefrontal cortex (F3) and cathode over the right (F4); 2 mA for 2 x 20 minutes/day (90-minute interval), 3x/week for two weeks, once to twice weekly thereafter with the same parameter settings. Concomitant medication (clozapine 600 mg/d, aripiprazole 10 mg/d, prerenzepine 50 mg/d, lorazepam 3 mg/d) was continued. A weekly clinical assessment was conducted that included the Bush-Francis Catatonia Rating Scale. Functional magnetic resonance imaging was performed before and after 70 and 140 tDCS sessions to assess resting-state functional connectivity, structural brain volumes (T2-FLAIR) and Diffusion Tensor Imaging (DTI), see Figure 1.

Results

The patient overall received about 130 tDCS sessions between August 2013 and March 2016. ECT was needed only once after a ten-day hospitalization for pneumonia in September 2013, during which time tDCS had been suspended. The patient showed fewer catatonic symptoms during tDCS treatment than during ECT treatment (BCRS scores: 20-27/69 during ECT, 4-12/69 during tDCS with one outlier of a BCRS score of 18 at the September 9, 2015; see Figure 2). His speech fluency, personal hygiene, and attendance at a sheltered workshop improved. Seed-based functional connectivity in the left insula and the frontal brain showed decreased variability at measurement t2 and t3 compared to baseline. Frontal and left insular connectivity increased after 140 tDCS sessions compared to baseline (see Figure 3). Post 70 tDCS sessions left insular connectivity decreased.

Discussion

The results of this first proof-of-concept study indicate that prefrontal tDCS may be a promising intervention for treatment of schizophrenia with predominant negative symptoms. Large-scale randomized controlled studies are needed to further establish prefrontal tDCS as a novel treatment for negative symptoms in schizophrenia.