

## Add-on HD-tDCS for obsessive-compulsive disorder with comorbid bipolar affective disorder: A case series



Rujuta Parlikar, Vanteemar S. Sreeraj\*, Harleen Chhabra, Vani Holebasavanahalli Thimmashetty, Soumya Parameshwaran, Sowmya Selvaraj, Venkataram Shivakumar, Janardhanan C. Narayanaswamy, Naren P. Rao, Ganesan Venkatasubramanian

National Institute of Mental Health and Neurosciences (NIMHANS), Department of Psychiatry NIMHANS, 560029, Bangalore, Karnataka, India

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### ABSTRACT

Obsessive-compulsive disorder (OCD) with comorbid bipolar affective disorder (BPAD) is often faced with a therapeutic challenge. Pharmacological treatment strategy engaged towards alleviating symptoms in OCD has the propensity to precipitate a manic switch in patients with comorbid BPAD. Advanced non-invasive brain stimulation techniques like high definition transcranial direct current stimulation (HD-tDCS) may target the symptoms of OCD while preventing a probable manic switch in a vulnerable population. In this case series, we targeted OC symptoms in three patients by giving 2 mA of anodal HD-tDCS at their pre-SMA (localized using 10/10 EEG system) with 4 surrounding return electrodes of opposite polarity for 20 min of two sessions having an intersession gap of 20 min receiving a maximum of 20 sessions. We found that the patients showed significant improvement (more than 25%) in their OC symptoms while having no affective side effects and this effect was replicated in one of the two patients in repeating the treatment for relapse. This case series highlights the efficacy and durability of the effect of HD-tDCS as an add-on treatment modality in three patients who were treated for OC symptoms in the context of a comorbid bipolar disorder, two of them receiving repeat courses on relapse.

### 1. Introduction

Bipolar affective disorder (BPAD) is one of the most debilitating psychiatric disorders (Goldstein et al., 2009) that is characterized by recurrent episodes of mania and depression occurring in phases, potentially jeopardizing the patient's mental health, his biological functions like sleep and appetite and his social functioning (Robinson and Nicol Ferrier, 2006). The therapeutic challenge that is faced in the management of manic phase of this illness with co-morbid anxiety disorder like the obsessive compulsive disorder (OCD), is a question of intense scrutiny, since SSRIs that are prescribed as the first line agents for OCD, have the propensity to precipitate mania in these patients (Sasson et al., 2003).

More recently, a novel brain stimulation technique called the transcranial direct current stimulation (tDCS), has been found to be useful in alleviating symptoms in patients with OCD (Bation et al., 2016; Brunelin et al., 2018). Though the effect of tDCS as a potential add on treatment modality for OCD in a patient with BPAD is not explored earlier, studies on bipolar depression suggest a lower propensity for a manic switch (Donde et al., 2018). HD-tDCS, which is an advanced form

of this technique, is proposed to have better focalization, better neuromodulation and longer lasting neuroplasticity (Kuo et al., 2013). It therefore, advocates the potential for providing equal if not better efficacy while also avoiding any unwarranted effects on non-targeted brain surface. Some of our initial application of HD-tDCS in patients has shown promising effects on symptoms of OCD. Hence, we provided add on HD-tDCS treatment to three patients for OCD who had a comorbid diagnosis of BPAD.

### 2. Case 1

Mr. S was a 26 year old unmarried man, educated up to 12<sup>th</sup> standard, from middle social economic background. Patient had history of ADHD and stammering since childhood. He also had a below average academic performance with an Intelligence quotient (IQ) of 68. Family history was suggestive of hypothyroidism and myasthenia gravis in 1<sup>st</sup> degree relative, BPAD, depression and psychosis in 2<sup>nd</sup> degree relatives with one suicide in a 2<sup>nd</sup> degree relative. At the time of presentation patient was suffering from 12 years of illness, characterized by irritability, anger outbursts, aggression, demanding behavior, expansive

\* Corresponding author.

E-mail address: [vs8sreeraj@yahoo.com](mailto:vs8sreeraj@yahoo.com) (V.S. Sreeraj).

ideations, reduced sleep and increased psychomotor activity. Alongside, there were sexual and contamination obsessions, with compulsive washing and reassurance seeking with significant socio occupational dysfunction. He showed lack of response to sertraline, mirtazapine that was also associated with manic switch. Patient had also failed a trial of 30 sessions of TMS with insignificant impact on the affective symptoms. On general examination, he had obesity with drug-induced extrapyramidal symptoms. He was on multiple mood stabilizers when referred for HD-tDCS with daily oral doses of Lithium 900 mg, valproate 1000 mg, Topiramate 150 mg, Risperidone 6 mg, propranolol 20 mg, Telmisartan 20 mg, Fluoxetine 40 mg and injection zuclopenthixol depot 600 mg fortnightly.

### 3. Case 2

Mr. A was an eighteen year old unmarried, 10<sup>th</sup> educated, gentleman from middle social economic background. He was temperamentally slow to warm up, who had a probable perinatal insult necessitating forceps assisted delivery with mild delay in milestones and markedly poor scholastic performance with an IQ of 73. He had hypothyroidism and was on supplemented with oral thyroxine. At the time of presentation patient was suffering from 4 years of illness characterized by obsessions of contamination and compulsive washing. This was associated with episodes of irritability and anger outburst, associated with disinhibited behavior, increased psychomotor activity, elevated mood, over-spending, demanding behavior and decreased need for sleep. More often than not, this clinical picture was precipitated with SSRIs like fluvoxamine and sertraline prescribed for OC symptoms even under cover of mood stabilizers (MS) and second generation antipsychotics (SGAs). His OC symptoms had shown minimal response to ondansetron 4 mg and pregabalin 300 mg. Patient had shown poor response to valproate, olanzapine and risperidone over the last 4 years. When he was planned for a treatment trial with HD-tDCS, patient's affective symptoms had shown partial response to a combination of daily dosing of lithium 900 mg, quetiapine 600 mg, oxcarbazepine 1800 mg and aripiprazole 40 mg.

### 4. Case 3

Mr. C was 34 year old unmarried man with a commerce graduation and stable employment with family history of alcohol dependence syndrome in father. At the time of presentation patient was suffering from 14 years of illness precipitated by dog bite with an abrupt onset and fluctuating course. His illness was characterized by obsessive doubts about contamination followed by compulsive checking and washing which was aggravated over the last 1.5 years. He had a history of an episode of depression and an episode of hypomania in preceding 3 years. Currently he was suffering from depressive symptoms for 2 months characterized by low mood, increased anxiety, decreased energy level, increased fatigue, crying spells, death wishes, disturbed sleep, disturbed appetite, weight loss associated with significant distress towards OC symptoms and work related dysfunction. He was initiated on lithium 600 mg/day with escitalopram 5 mg/day. In view of a better and faster response, in addition to patient's personal choice of receiving a trial with non-invasive brain stimulation treatment, HD-tDCS was offered.

### 5. HD-tDCS treatment

For all the three patients, in view of their persistent OC symptoms and anticipating the possibility of manic switch with the SSRIs, a trial of an add-on treatment with HD-tDCS was considered. After patients were explained about the treatment procedure and shown a video of the same, a written informed consent was taken. Treatment was initiated in compliance with the declaration of Helsinki.

The first two patients received a total of 10 days of HD-tDCS while

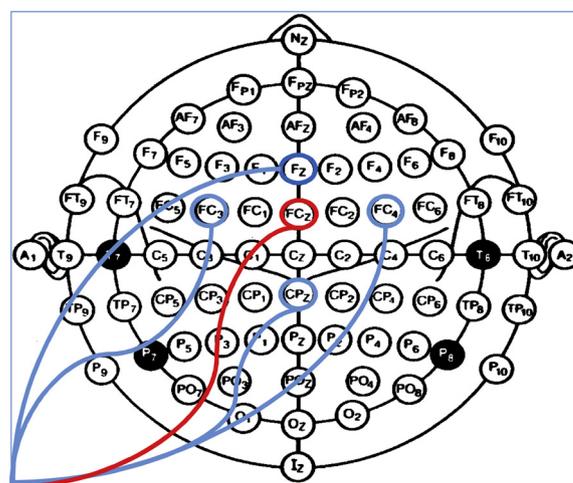


Fig. 1. Electrode placement for pre-supplementary motor area (pre-SMA) stimulation (Red rings over FCz indicates central anodal electrodes with +2 mA and blue rings at Fz, FC3, FC4 and CPz indicate cathodal return electrode with -0.5 mA). (Modified image from <http://www.oegkn.at/images/downloads/10-10.JPG>).

the last patient received only 5 days on account of logistic reasons. Two sessions, each lasting 20 min was given every day with an intersession interval of 20 min using the 10/10 EEG electrode placement with location of anode at FCz (pre-supplementary motor area (pre-SMA)) targeting 2 mA of current and four return cathodal electrodes of -0.5 mA at Fz, FC3, FC4 and CPz (Fig. 1). Adverse effects were assessed with a structured questionnaire applied after every session (Brunoni et al., 2012).

### 6. Illness course after treatment

On completion of treatment trial, Yale brown Obsessive compulsive scale (YBOCS) (Goodman et al., 1989) score declined by 29% in Mr. S, 64% in Mr. A and 45% in Mr. C (Table 1). In Mr. S and Mr. A, Young's Mania Rating Scale (YMRS) (Young et al., 1978) scores remained stable (2 & 0, respectively) but a reduction of 3 points (baseline = 4, post HD-tDCS = 1) was noted in Mr. C's score with improvement in mood and sleep. Except for mild tingling sensation in most of the sessions in Mr. C, no other adverse effect was noted in any of the patients.

Mr. S was maintaining improvement for roughly 2 years after which presented with a relapse of symptoms, characterized by irritability, anger outbursts, sexual and contamination obsessions. His YBOCS score was 28 at the end of 2<sup>nd</sup> year which dropped to 11 (> 50% improvement) after receiving 10 sessions of HD-tDCS treatment. At the time of 2<sup>nd</sup> course of treatment, patient was on daily dose of fluoxetine 50 mg, lithium 900 mg, valproate 1 g, topiramate 100 mg and monthly paliperidone depot 150 mg. During in-patient care, risperidone was tapered down gradually and zuclopenthixol was stopped. The affective symptoms like irritability were observed secondary to the OC symptoms during follow up and were ameliorated with the course of HD-tDCS treatment. The patient gave no history of any independent episode of BPAD in the two years prior to follow up.

The improvement persisted for nearly three months in patient A. Following relapse of OC symptoms, he was provided with fluoxetine which caused a manic switch and his mood symptoms were controlled by adding olanzapine 20 mg and haloperidol 5 mg/day. Though the patient reported of fluctuating mood symptoms, history was inadequate to determine the course of BPAD in the 3 months prior to follow up. Following admission with persistent OC symptoms, a repeat course of 20 sessions HD-tDCS was offered but for with no benefit. For affective symptoms, medications were modified to lithium 900 mg, carbamazepine 600 mg, amisulpride 800 mg, topiramate 50 mg, valproate



subjects with external factors like medications influencing the effect of stimulation. The reason for this delayed non-response in the current subject could not be established (Horvath et al., 2014).

This case series describes for the first time the tolerability and effectiveness of HD-tDCS as an add-on treatment modality in OCD patients who are also suffering from BPAD. Also, it provides a valuable information on long-term effectiveness with repeated courses of treatment. A limitation of the study is the lack of stable medication profile in patients as they were being prescribed mood stabilizing agents and smaller up titrating doses of antidepressants while being treated with HD-tDCS. But, as with similar regime these patients had shown manic switch earlier reassures the safety of HD-tDCS in BPAD. Also, the relapse of OC symptoms after few months while on higher doses of the antidepressant suggests the effectiveness of HD-tDCS rather than medications. We can also implicate the role of pre-SMA in the context of therapeutic benefit in OCD. This report encourages to explore whether HD-tDCS as an add-on treatment modality really has a targeted approach at alleviating OC symptoms without asserting the possibility of inducing changes in the affective symptoms unlike the conventional SSRIs and this report implores to further answer its' comparability with conventional tDCS. More rigorous studies and randomized trials are required to be able to comment on these research questions.

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There are no relevant financial disclosures to report.

#### Conflict of interest

There are no potential conflicts of interest to report.

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