

MOTOR CORTEX TRANSCRANIAL DIRECT CURRENT STIMULATION (tDCS) IMPROVES ACUTE STROKE VISUO-SPATIAL NEGLECT: A SERIES OF FOUR CASE REPORTS

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To the Editor:

Visuospatial neglect remains a relatively misunderstood complication of stroke. Up to 72% of right hemispheric strokes present neglect symptoms, and up to 75% of those patients still suffer at the 3-month mark [1]. This leads to marked increases in dependency, and lower functional outcomes [2].

Transcranial Direct Current Stimulation is a new rehabilitation tool that has been gaining popularity in the last two decades [3]. Current research focuses on subacute or chronic strokes, while stimulating the posterior parietal cortex (PPC), and seems to have positive effects on visuospatial neglect [4].

Four patients were included in this case report: patient 1, a 74-year-old right-handed male patient was admitted at the University hospital's stroke unit with right-sided posterior cerebral artery (PCA) infarction and presented left visuo-spatial neglect. Patient 2: a 69-year-old right-handed male patient with right-sided middle cerebral artery (MCA) infarction and presented left visuo-spatial neglect. Patient 3: a 73-year-old right-handed male patient with right-sided posterior cerebral artery (PCA) infarction and presented left visuo-spatial neglect. Patient 4: a 59-year-old right-handed male patient with right-sided posterior cerebral artery (PCA) infarction and presented left visuo-spatial neglect. The patients understood the study, and gave written and oral consent according to the Declaration of Helsinki (1964). The protocol was approved by the University Hospital's ethics committee.

Transcranial direct current stimulation (tDCS) was delivered using standard equipment (Starstim TCS, Barcelona, Spain) following a protocol in which sham and active stimulation sessions were administered in randomized order and double-blind conditions. Treatment began 48h after stroke, following the hospital's protocol to keep patients prone during that time. The patients received 20 minutes of anodal stimulation (anode placed on C4, cathode on FP1 based on the international EEG 10–20 system), using two electrodes covered by saline soaked 25cm² sponges, at 2mA daily. For patients 1 and 2, during weeks 1 and 3 patient received 20 minutes of tDCS, whilst during weeks 2 and 4, patient received 20 minutes of placebo (ramping up the current to 2mA over 15 seconds then the device automatically switches off). For patients 3 and 4, during weeks 1 and 3 patient received 20

minutes of placebo, whilst during weeks 2 and 4, patient received 20 minutes of tDCS. During stimulation, the patient was seated in a comfortable position in a calm, quiet and isolated room, and was instructed not perform any activity. In addition to the tDCS or placebo, the patient received 60 minutes of physical therapy (30 minutes of conventional therapy and 30 minutes peddling on a stationary bike), 30 minutes of occupational therapy, and 30 minutes of neuropsychology. The evaluator and therapists were different people. We evaluated neglect with the Catherine Bergego Scale (CBS), the Line Bisection Test (LBT) as described by Utz [5], and the Star Cancellation Test (SCT).

Observations

Data from the different tests were gathered and presented in **Figs. 1** and **2**. Results are expressed as percentages of improvements.

Discussion

Patient's performance seems to follow the experimental design and during the two weeks of stimulation, progress was much faster than during the two weeks of placebo.

To the best of our knowledge, this is the first time that tDCS has been applied to the primary motor and sensory cortex in neglect patients and that the improvements were greater during the two weeks of treatment. Most of the available research found improvements after stimulating either unilaterally or bilaterally the PPC, but focuses on subacute or chronic patients [4]. Very little research has been done using tDCS in the acute stroke setting, probably due to the relatively unstable population [6]. The improvements by stimulating the motor cortex could in part be due to the reduced interhemispheric inhibition [7] which could improve ability to explore neglect side [8]. Another explanation could be the relatively large size of electrodes, combined with a current that disperses in the brain, which could overlap and end up influencing the PPC [9]. The patient did not report any additional symptoms (evaluated by a simple VAS scale), and could not distinguish which treatment he was receiving.

Hemineglect does spontaneously resolve itself. Depending on the severity of neglect, there are big decreases in the first week for severe neglect and during the first three months for moderate neglect [10] at a constant rate. But by using a double-blinded crossover study, we find in this case report that during the weeks of real tDCS, improvements were much greater than in the weeks with sham tDCS.

In summary, our case reports support the feasibility and usefulness of tDCS in the acute stroke setting, as well as for visuo-spatial neglect patients obviously. A larger scale study is necessary to confirm the findings of this first “proof of principle” experiment.

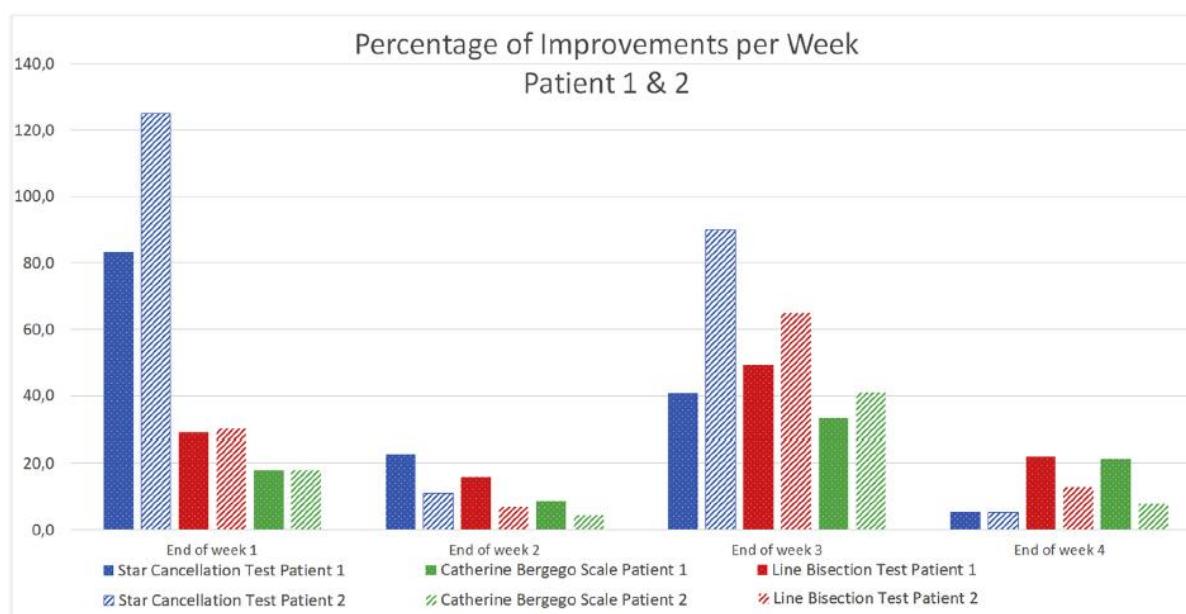


Fig. 1. Percentage of improvements per week for patients 1 and 2.

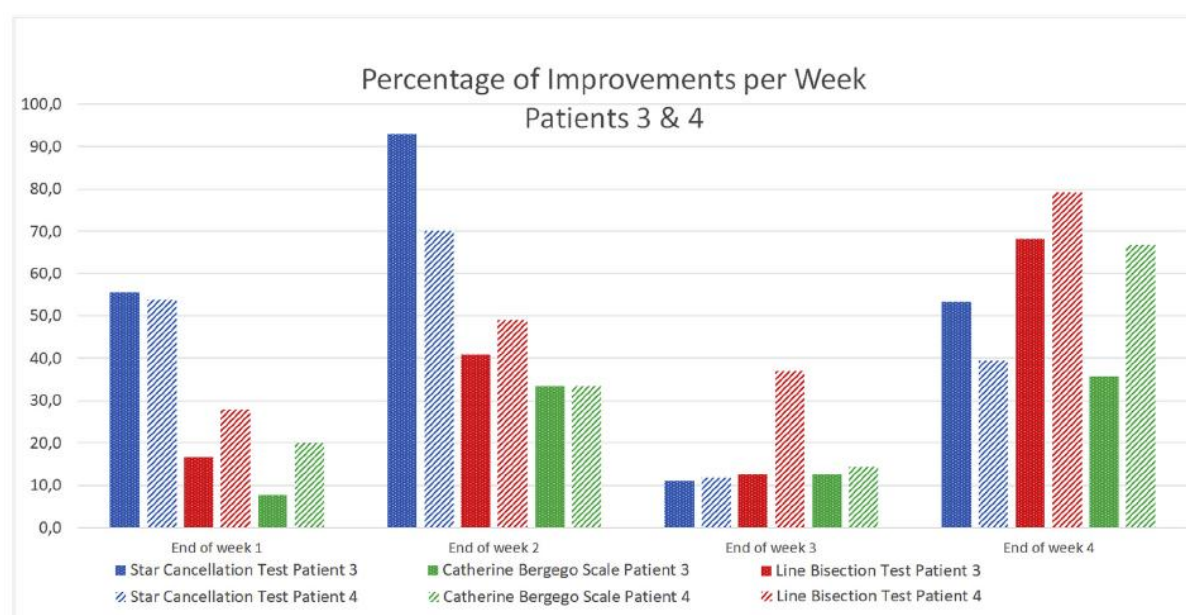


Fig. 2. Percentage of improvements per week for patients 3 and 4.

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