Bilateral motor cortex tDCS effects on post-stroke pain and spasticity: A pilot study

Ángeles Salas Sánchez[1], Belén Álvarez Batista[1], Carlos Cordero García[2], José R. Alameda Bailén[1], Rafael Andújar Barroso[1], Michael Nitsche[3,4], G. Nathzidy Rivera-Urbina[5], A. Molero-Chamizo[1]
[1]University of Huelva. Department of Psychology. Spain
[2]Rehabilitation Area, Hospital Juan Ramón Jiménez, Huelva
[3]Leibniz Research Centre for Working Environment and Human Factors, Dortmund, Germany
[4]Department of Neurology, University Medical Hospital Bergmannsheil, Bochum, Germany
[5]Autonomous University of Baja California, Mexico

There are not optimal treatments for limb chronic pain of post-stroke patients. tDCS is a safe and non-invasive brain stimulation technique that alters cortical excitability and, therefore, might improve pain and spasticity symptoms in these patients [1,2]. The aim of this pilot study was to explore the effect of multiple anodal tDCS (atDCS) sessions on limb pain and spasticity of 3 post-stroke patients, as well as the safety profile of the intervention. The results showed a significant effect of atDCS on the perception of pain evaluated by different scales when compared to sham stimulation. In one patient the pain was completely relieved, and no variable other than stimulation could explain this effect. The improvement effect in the other 2 patients was also significant, but considerably lower compared to the first patient. The high interindividual variability associated with the clinical and cognitive effects of tDCS could explain these differences. No serious adverse effects (beyond scalp tingling sensation) were reported in any of the patients during the treatment.

METHOD

Three post-stroke patients (2 women and 1 man, mean age 57,3 years old), with high levels of chronic upper limb pain and spasticity, were recruited for this crossover, sham-controlled pilot study. The study was approved by the regional Ethics Committee for biomedical research (CEI), Huelva (PI 010/15) and conformed to the principles of the World Medical Association Declaration of Helsinki. Each participant received 5 consecutive sessions of anodal and sham stimulation (1.5 mA, 20 min) in randomized order (with a 3-week washed period). Anodal electrode was positioned over the M1 of the affected hemisphere (cathode over the homologous contralateral area) (Figure 1). The procedure was identical for sham condition, except that real current was only applied during the first and last 10 seconds. Pre-and post-tDCS pain measures were taken in each stimulation session and in each of the applied conditions (anodal and sham). Fugl-Meyer [3] and Adaptive Visual Analog Scales (AVAS) of pain intensity and improvement [4] were applied to obtain values of the dependent variable.

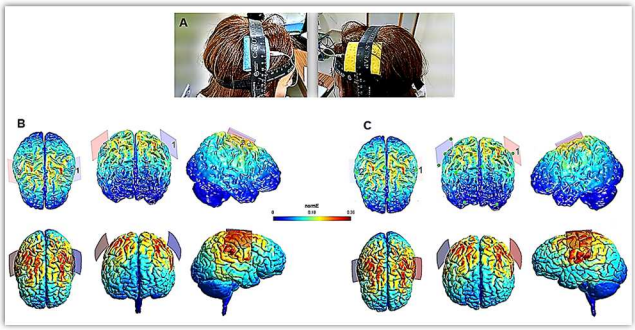

Figure 1. tDCS electrode configuration used in this study (A), and brain electric field intensities calculated by the finite element method for anodal tDCS over the right (B) and left (C) hemisphere

RESULTS

In all patients, values of the AVAS pain improvement were increased after the first atDCS, but they were not after sham stimulation (Figure 2). The Fugl-Meyer values of pain relief were significantly increased in the atDCS condition, compared to sham tDCS (Figure 3).

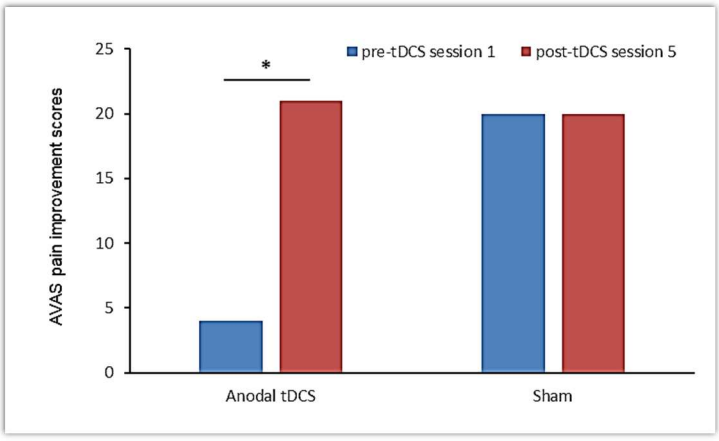

Figure 2. Average values of the AVAS pain improvement for all patients (pre and post-stimulation) in both tDCS conditions.

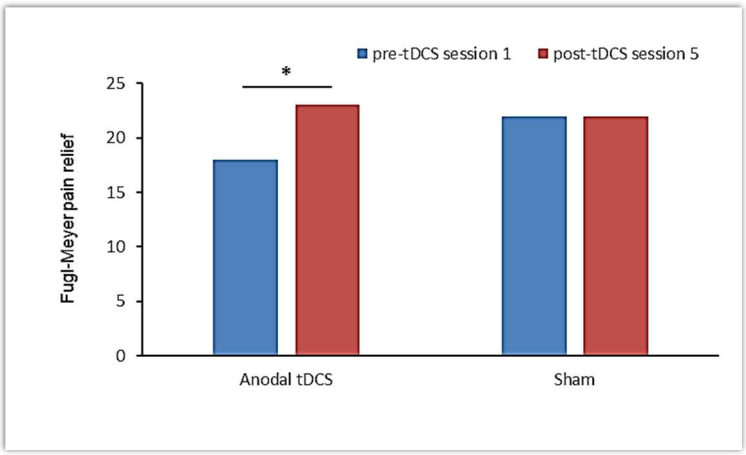

Figure 3. Average values of the Fugl-Meyer scale indicating pain relief in both tDCS conditions for all patients. Pre-stimulation values of session 1 are compared to post-stimulation values of session 5 (24 = maximum pain absence).

CONCLUSIONS

In the present study, possible changes in the perception of pain induced by tDCS were evaluated in stroke patients using various pain and spasticity scales. The findings suggest that multiple sessions of atDCS are a safe intervention for improving the self-reported limb pain in post-stroke patients. Further studies including a broader follow-up period, more representative samples of patients and more optimal stimulation protocols are necessary to demonstrate the potential and safety of tDCS to improve chronic pain in these patients.

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