ANTINOCICEPTIVE MECHANISMS OF TRANSCRANIAL DIRECT CURRENT STIMULATION (tDCS) ON NEUROPATHIC PAIN IN RATS

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Introduction: Neuropathic pain is relatively common and occurs in approximately 6–8% of the population. Thus, non-pharmacological treatments, such as transcranial direct current stimulation (tDCS) may be useful for relieving pain. Our aim was to investigate the antiallodynic effect of tDCS in a mice model of neuropathic pain, and the underlying neurotransmission systems that could drive these effects; and also peripheral influence of tDCS in the same animal model.

Methods: Male, Swiss mice, weighing 25–35g, were subjected to partial sciatic nerve ligation (PSNL). Allodynia was assessed using a Von Frey filament (0.6 g). First, the behavioral time-course of these mice was assessed after 5, 10, 15 and 20 min of tDCS (0.5mA). Second, the mice that underwent PSNL were assigned to either the tDCS (0.5mA,15 min) or tDCS sham group, and further assigned to receive either saline or a drug (i.e., naloxone, yohimbine, a-methyl-p- tyrosine, q-chlorophenylalanine methyl ester, caffeine, 1,3-dipropyl-8- cyclopentylxanthine, AM281, AM630, flumazenil, MK-801, or lidocaine). One way ANOVA, or two-way ANOVA repeated measures, followed by Tukey's test was performed to analyze the results.

Results: The antiallodynic effect of tDCS lasted 2 h and 4 h, after 10 min and 15 or 20 min of treatment, respectively (P<0.001, P<0.01, and P<0.05, respectively). The antiallodynic effect of tDCS was associated with all the systems that were analyzed, i.e., the opioidergic (P<0.01), adenosinergic (P<0.001), serotonergic (P<0.01), noradrenergic (P<0.001), cannabinoid (P<0.001), GABAergic, and glutamatergic (P<0.001) systems. Lidocaine did not reverse the antiallodynic effect of tDCS (P>0.05).

Conclusion: Our findings demonstrated that bicephalic tDCS elicited an antiallodynic effect in a PSNL murine model of neuropathic pain. Furthermore, the antiallodynic effect of tDCS was associated with different neurotransmitters systems. In addition, the time course revealed that the duration of application was directly associated with the after-effects response.

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