

EFFECTIVENESS OF TRANSCRANIAL MAGNETIC STIMULATION IN THE TREATMENT OF CHILDREN WITH CEREBRAL PALSY

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Abstract

The need for medical rehabilitation of children with disabilities remains extremely high and accounts for at least 95% of their total number. Cerebral palsy (CP) constitutes approximately 24% of all neurological diseases. Childhood disability resulting from this pathology represents one of the most urgent medical and social problems of modern society and has national significance. In this context, it is essential to improve the quality of medical care, enhance early diagnosis of disabling diseases, develop and refine modern high-technology treatment methods, and implement effective preventive strategies.

Transcranial magnetic stimulation (TMS) is a non-invasive method of brain stimulation that evaluates corticospinal tract conductivity through modulation of cortical excitability and depolarization of corticospinal neurons. As a non-invasive and painless technique, TMS applies electromagnetic principles to specific brain regions, regulating the functional activity of different cortical areas by altering neuronal excitability. Currently, TMS is increasingly used in the treatment of children with cerebral palsy. It has been shown to improve motor function, reduce spasticity, restore speech function, and modulate brain function through enhancement of neuroplasticity in patients with CP.

Keywords: Transcranial magnetic stimulation, cerebral palsy, spastic diplegia, pediatric neurorehabilitation, motor function recovery, ideomotor apraxia, neuroplasticity, non-invasive brain stimulation.

Introduction

Aim of the study

To evaluate the effectiveness of transcranial magnetic stimulation as a novel method for restoring motor function in children with spastic diplegic cerebral palsy.

Materials and Methods

The study included 70 children diagnosed with spastic diplegic cerebral palsy accompanied by ideomotor apraxia. The participants were divided into two groups: the main group (34 children) and the comparison group (36 children). Children in the main group received repetitive TMS (rTMS) therapy for 20 days (5 sessions per week for 4 weeks), consisting of 1000 pulses at 5 Hz applied to the affected cerebral hemisphere for 15 minutes per session. Assessments were conducted before treatment (T0), 10 days after initiation of therapy (T1), and after completion of the treatment course (T2).



Results

Assessment of overall motor dysfunction in children of the main group with spastic diplegic cerebral palsy and ideomotor apraxia revealed grade I impairment in 32.4% (11 children), grade II impairment in 47% (16 children), and grade III impairment in 20.6% (7 children). In the comparison group, grade I impairment was observed in 27.8% (10 children), grade II in 50% (18 children), and grade III in 22.2% (8 children).

Following TMS therapy, significant improvements in motor and speech functions were observed in children with spastic diplegic cerebral palsy. Prior to treatment, grade I motor impairment was identified in 32.4% (11 children), whereas after treatment this increased to 55.8% (19 children). Grade II and III impairments, previously observed in 47% (16 children) and 20.6% (7 children), decreased to 35.4% (12 children) and 8.8% (3 children), respectively. Overall, improvement in motor function was noted in 35.3% (12 children).

According to the Timed Up and Go (TUG) test before treatment, 20.6% (7 children) completed the task in 13–16 seconds, 29.4% (10 children) in 17–20 seconds, and 50% (17 children) required more than 20 seconds. After TMS therapy, 53% (18 children) completed the task in 13–16 seconds, 38.2% (13 children) in 17–20 seconds, and only 8.8% (3 children) required more than 20 seconds. Overall improvement according to TUG test results was observed in 73.5% (25 children).

Analysis of Kertes apraxia test scores before treatment showed that 26.4% (9 children) scored 0–20 points, 32.4% (11 children) scored 21–40 points, and 41.2% (14 children) scored 41–60 points. After treatment, 50% (17 children) scored 0–20 points, 32.4% (11 children) scored 21–40 points, and 17.6% (6 children) scored 41–60 points. Following TMS therapy, children demonstrated improved performance in tasks such as making a fist, scratching the head, using a comb, spoon, and hammer, folding paper, lighting a match, and simulating piano playing. Overall effectiveness according to the apraxia assessment was observed in 47.1% (16 children).

In contrast, children in the comparison group who underwent conventional rehabilitation measures did not demonstrate significant improvements in overall motor function, TUG test, Kertes apraxia test, or Ashworth scale scores. Minor changes were observed, but they were not clinically significant.

Conclusion

Thus, transcranial magnetic stimulation demonstrated an overall effectiveness of 51.5% in improving motor function, TUG test performance, Kertes apraxia test scores, and Ashworth scale outcomes in children with spastic diplegic cerebral palsy.

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