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Retracted Article: Effect of Short Term Use of Repetitive Transcranial Stimulation as an Adjuvant Therapy for Bell's Palsy

Samira Oshaghi [1], Keyvan Ghadimi [2,*], Ahmad Rezaeian [3] and Zeinabsadat Dokhanchi [3]

[1] Physical Medicine and Rehabilitation, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran
[2] School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran
[3] Department of Otorhinolaryngology, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

[*] *Corresponding author*: School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran. Email: keyvanghadimi@yahoo.com

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Abstract

Background: There is limited therapy for management of Bell' palsy. However, none of the treatment modalities are effective, thus, the aim of this study was to evaluate the effect of repetitive transcranial stimulation (rTMS), as an adjuvant therapy, for management of Bell's palsy.

Methods: In this randomized controlled trial, 46 patients with unilateral Bell's palsy were enrolled and were divided to two parallel groups an intervention and control groups. The intervention group was under treatment with oral prednisolone 1 mg/kg/day for two weeks and, continued with physical therapy/daily and rTMS/five sessions a week/3000 stimuli, 120% motor threshold) for two weeks and the control group was under treatment with oral prednisolone 1 mg/kg/day for two weeks and continued with physical therapy/daily for two weeks. The outcome was measured with the facial disability index (FDI), House-Brackmann (H-B) scale and World Health Organization quality of life (WHOQOL)-BREF questionnaire at baseline, and two and four weeks after therapy.

Results: The physical and social functions of FDI and WHOQOL-BREF questionnaire in the intervention group were significantly higher than the control group after four weeks. Also, H-B grading in the intervention group was better than the control group after four weeks.

Conclusions: The rTMS as adjuvant therapy may be an effective, non-invasive, and safe method for management of Bell's palsy.

Keywords: Bell's Palsy, Repetitive Transcranial Stimulation, Improvement, Adjuvant Therapy

1. Background

Facial paralysis mostly involve the facial nerve and can effect quality of life. This nerve includes sensory, motor and parasympathetic fibers and damage to this nerve can effect sensory, motor and parasympathetic conditions. The symptoms of facial palsis includes incomplete eye closure, weak eyelid lifting, loss of taste sensitivity, dry eyes, drooping of mouth corner, ear pain, and hyperacusis. Facial paralysis is divided to two categories, including central and peripheral. In central facial paralysis, the disorder is above the facial nucleus while the disorder in facial nerve and nucleus is in peripheral facial paralysis. Bell's palsy is an idiopathic subtype of the peripheral facial nerve (1, 2). The most common hypotheses about the etiology of Bell's palsy are rheumatic, viral, immunological, and herpes infection. The incidence of Bell's palsy is 15 to 40 cases per 100000 of the general population and is prevalent in females and middle age groups (3, 4). In adults, aging, pregnancy, and diabetes are significant risk factors of Bell's palsy and getting colds is a risk factor in children (5, 6). High dosage of steroids is used as a bolus dose in onset and tapered off over the next one to two weeks, also physiotherapy is done as complementary therapy, including galvanism, massage, and facial exercises. Also, surgical management is suggested for damage to the nerve and muscle (7, 8). The use of electrical stimulation for Bell's palsy is another therapeutic approach that has been previously reported (9). Considering that various therapeutic methods have been used with different results for the treatment of Bell's palsy, and in particular, no standard treatment for this disease has been provided, for the first time, single-pulse transcranial stimulation was used as a therapeutic tool in 1985 (10). Repetitive transcranial stimulation (rTMS) is a safe and non-invasive method of brain stimulation, in which the magnetic field induces an electric field in the cerebral cortex, and this electric field causes the depolarization of neurons (11).

2. Objectives

Therefore, in the current study, the researchers assessed which rTMS could be useful in the treatment of Bell's palsy. The aim of this study was evaluation of the effect of rTMS on the treatment of Bell's palsy.

3. Methods

3.1. Study Design

In this randomized, clinical trial, which was approved in Isfahan University of Medical Sciences (No.: 395039) and was registered at the Iranian Registry of Clinical Trial (IRCT2017100312782N20), 59 patients with unilateral Bell's palsy were referred to the physical medicine and rehabilitation clinics in 2015 to 2017. This research selected 46 patients (21 males and 25 females) with the mean age of 46.78 ± 14.14 years, according to the inclusion and exclusion criteria. All patients were diagnosed according to clinical findings, physical examination, electromyography, and electroneurography. Inclusion criteria included patients with unilateral Bell' palsy, aged over 18 years old, and informed consent to participate in the study. Also, patients with a history of botulinum toxin injection in the last six months, uncontrolled diabetes, severe hypertension, liver and kidney disease, peptic ulcer, history of treatment for facial nerve palsy or previous history of facial nerve paralysis or recurrence of disease, other neurological disorders, such as seizure, traumatic brain injury or stroke, pregnancy, middle ear disease, and history of facial muscle surgery, were excluded. Patients, who had severe complications or were not followed up, were excluded from the study. The patients were randomly allocated with the random allocation software to two parallel groups as intervention and control groups. The intervention group was treated with oral prednisolone 1 mg/kg/day for two weeks, and after treatment, the treatment was continued using exercise physiotherapy and rTMs for six sessions in two weeks. The control group was treated with oral prednisolone 1 mg/kg/day for two weeks, and after the end of oral therapy, the exercise physiotherapy was continued for two weeks (six seasons) on a daily basis. The rTMS was done with 1000 stimuli, and 120% intensity of resting motor threshold (RMT) with eight coils and the device was the Magstim Rapid stimulator (Magstim Company, Dyfed, UK). The site for recording stimulation was prefrontal. The frequency of stimulations was 1 Hz rTMS (1 train, 1000 Stimuli) and 10 Hz (20 trains, 50 stimuli per train, the intertrain interval of 25 seconds).

3.2. Assessments

The outcomes were measured with facial disability index (FDI), House-Brackmann (H-B) scale, and the World Health Organization quality of life (WHOQOL)-BREF questionnaire. The FDI consists of 10 items in two areas: physical and social/well-being functions. The physical and social function of FDI consists of five different questions about facial muscles function (12). The H-B scale is a grading for measurement of facial nerve dysfunction, and this scale consists of six grades as normal (1), mild (2), moderate (3), moderately severe (4), severe (5), and total paralysis (6) (13). The WHOQOL-BREF questionnaire consists of 26 items that assess the quality of life of patients in four areas of physical health, psychological, social relationships, and the environment (14). These scales were recorded at baseline, two and four weeks after treatment and the doctor, who recorded these scales was unaware of the implementation of the study. Also, the demographic information of patients was recorded on a checklist, and included age, gender, duration of Bell's palsy, involved side, and complications.

3.3. Statistics

The sample size was calculated according to confidence level of 95% and the power detection was 80%. Also, the means were 0.50 and 0.82 (15). Therefore, the sample size was 23 for each group. All data were analyzed with the SPSS software. Chi-square, independent *t*-test, and Mann Whitney were used to compare the two groups, and the repeated measure analysis of variance (ANOVA) was used to compare variables at different times. Also, data were shown as number (along with percentage) and mean ± SD. The P value < 0.05 was considered a significant threshold.

4. Results

In this study, 46 patients participated in the intervention group (12 males and 11 females, mean age 47.17 ± 13.65 years) and the control group (nine males and fourteen females), also there were no significant differences between two group regarding age (P = 0.68), gender (P = 0.37), involved site (0.13) and duration of disease (0.53) (demographic information of patients is summarized in Table 1). The physical and social functions of FDI, H-B grading, and WHOQOL-BREF questionnaire were recorded at the baseline, and after two and four weeks. At baseline and after two weeks, these scales were insignificant in

Table 1. Demographic Information of Patients[a,b]

Characteristic	Intervention Group	Control Group	P Value
Number	23	23	-
Gender			0.37*
Male	12 (52.2)	9 (39.1)	
Female	11 (47.8)	14 (60.9)	
Age (y)	47.17 ± 13.65	46.39 ± 14.92	0.68**
Involved side			0.13*
Right	15 (65.2)	10 (43.5)	
Left	8 (34.8)	13 (56.5)	
Duration of disease (d)	19.65 ± 10.23	19.95 ± 12.37	0.53**

[a] Values are expressed as No. (%) or mean ± SD.
[b] * Chi squire test, ** independent *t*-test.

both groups yet after four weeks, physical and social functions of FDI and WHOQOL-BREF questionnaire in the intervention group were significantly higher than the control group (P value was 0.04 for physical function, 0.03 for social function, and 0.02 for the WHOQOL-BREF questionnaire). Also, there was a significant difference between both groups, according to H-B grading (P = 0.03) (Other data are summarized in Table 2). Also, repeated mesure ANOVA showed that changing of physical and social functions of FDI and WHOQOL-BREF scales were significant at different times (P < 0.001, for all). None of the patients had severe complications. One patient of the intervention group and two patients of the control group were excluded from the study.

5. Discussion

According to the current results, the addition of rTMS to the treatment of Bell's palsy has a large effect because the scores, such as physical and social functions of FDI and WHOQOL-BREF questionnaire after the four weeks in the intervention group were higher than the control group. Also, three patients in the intervention group had normal function after four weeks. Therefore, the addition of rTMS can be affected by social and physical functions, grading of Bell's palsy, physical health, psychological, social relationships, and the environment in patients with Bell's palsy. In a pilot study by George et al. (16) in 1995, that evaluated the effect of rTMS for five patients with depression, it was shown that depression scores were improved in patients and mood and depression completely remitted. Also, the authors suggested daily left prefrontal rTMS for management of depression as a safe and well-tolerated procedure. In the study performed by Forogh et al. (17), who investigated rTMS effects on the postural balance problems in 26 stroke patients, it was concluded that adjuvant of rTMS could improve the effect on static postural stability, coordination, falling risk, muscle strength, and recovery in the stroke patients. Also, Jhanwar et al. (18) evaluated the effect of rTMS as an adjuvant therapy for 21 patients with resistant depression and only four patients had headache as a side effect, yet there was no serious adverse effect. Also, the authors suggested rTMS as an augmenting therapy in resistant depression. In another study that explored the effect of cerebellar rTMS on cerebellothalamocortical pathways in ten healthy subjects, the motor threshold and stimulation were 120% and 1000 stimuli, respectively, and the frequencies were 1 and 10 Hz, that is low frequency (1 Hz) of rTMS increased short intracortical inhibition (SICI) and high frequency had no effect on alternation of SICI (19). Also, the therapeutic effects of rTMS in neurological patients was observed, in which the use of rTMS increased the speed of movement and decreased tremor in resting mode in Parkinson's disease and reduced spasticity in patients with Parkinson's disease and multiple sclerosis (20-22). In a randomized clinical trial study by Tuncay (9), who evaluated the effect of electrical stimulation as adjuvant therapy in 50 patients with Bell's palsy and outcomes measured with H-B scale and FDI scores, it was concluded that addition of electronic stimulation (3 weeks/daily) after onset of treatment improved functional facial movements and outcome measurements. In a review article by Galhardoni et al. (23), it was demonetarized that rTMS has a high effect on the management of chronic pain. Also, the low frequency of rTMS is an effective method for patients with aphasia after stroke (24).

The current research was the first to study the effect of rTMS as adjuvant therapy in Bell's palsy, and showed that rTMS has greater effect on the improvement of functions in this disease. Also, this study suggested rTMS as an effective, safe, and non-invasive method for improvement of Bell's palsy and the limitation of this study was low sample size, and short follow up. It is recommended to perform future studies in this regard with a larger sample size and extended follow up.

Footnote

Financial Disclosure: This study approved in Isfahan University of Medical Sciences and IRCT.

Table 2. The Physical and Social Functions of FDI, House-Brackmann (H-B) Scale and WHOQOL-BREF Questionnaire in Both Groups at Baseline, and Two and Four Weeks After Treatment[a]

Variable	Intervention Group	Control Group	P Value
Physical function of FDI			
Baseline	46.26 ± 13.35	47.65 ± 11.30	0.72
After 2 weeks	64.34 ± 12.29	66.27 ± 11.58	0.65
After 4 weeks	77.45 ± 12.50	69.80 ± 11.62	0.04
Social function of FDI			
Baseline	49.08 ± 12.80	49.39 ± 11.97	0.89
After 2 weeks	67.56 ± 13.96	67.81 ± 11.	0.88
After 4 weeks	80.18 ± 13.88	71. ± 12.	0.03
House-Brackmann grading			0.41
Baseline			
Mild	4 (17.4)	2 ( )	
Moderate	9 (39.1)	14 (60.9)	
Moderately severe	7 (30.4)	6 (26.1)	
Severe		1 (4.3)	
After 2 weeks			0.59
Mild	13 (56.	13 (59.1)	
Moderate	7 (30.4)	8 (36.4)	
Moderately severe	3 (13)	1 (4.5)	
After 4 weeks			0.03
Normal	3 (13.6)	0 (0)	
Mild	18 (81.8)	15 (71.4)	
Moderate	1 (4.5)	6 (28.6)	
WHOQOL-BREF questionnaire, total score			
Baseline	58.26 ± 14.31	57.43 ± 11.85	0.83
After 2 weeks	68.17 ± 12.58	66.50 ± 11.58	0.70
After 4 weeks	76.81 ± 12.59	69.52 ± 10.60	0.02

Abbreviations: FDI: facial disabili dex, W QOL: World Health Organization quality of life.
[a] Values are expressed as No. (%) or m ± SD.

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