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KNJIGA 4.

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O EKSPERIMENTALNOM TREMORU

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A. JUŠIĆ, S. DOGAN AND N. FRONJEK

THE EFFECTS OF LOW FREQUENCY MUSCULAR STIMULATION ON EXTRAPYRAMIDAL SYMPTOMS

Since 1968 patients with Parkinson's syndrome have been treated with the method of low frequency muscular stimulation developed by Hufschmidt (1) for treatment of spasticity.

A total of 30 patients, aged between 34 and 73 were treated with this method. All these patients were examined by necessary clinical, laboratory and X-ray analysis.

Stimulation was performed by the stimulator »Spasmotron« using parameters proposed by Hufschmidt (1). Two pairs of electrodes were located on each antagonistic or symmetric muscular group. The procedure regularly started with the stimulation of the trapezius-deltoideus, biceps-triceps, extensorsflexors of the hand and fingers. In the lower extremities the lumbar musculature or biceps femoris was stimulated alternately with m. vastus medialis — m. gluteus medius of the contralateral side. To minimize speech impairment and pseudohypersalivation due to swallowing insufficience, the laryngeal region and perioral musculature were stimulated by paired electrodes. The stimulation was at first applied every day, then every second day, and finally, to stabilize the effect achieved, once a week.

The results of the therapy were recorded by standardized clinical examination and photographically. They were evaluated by the modified »North Western University Disability Scale« questionnaire (2) revised by us for pourpose of this examination. The elements scored by the questionnaire were walking (A), dressing (B), eating (C), and talking (D). Three instructive cases will be presented in more details.

Case 1: D. E., 50 years old, housewife. Last four years she had developed rigidity, first in the left and then in the right extremities. In the period preceeding her coming to the hospital she could no longer go out, or dress herself, or use the spoon or fork, or bring the cup to her mouth, or turn in bed.

The neurological findings on admission: The patient was able to walk and sit only if helped by somebody. When sitting, the defect of postural fixation was present, with the trunk falling back. When standing she could not turn to the left at all. She could turn to the right with much help only. She showed a marked progravitation posture,

propulsion was pronounced, and she was dragging her feet while walking. No tremor was observed. The fingers were considerably deformed due to contracture; the most severely attacked was the ulnar abduction in the metacarpophalangeal joints.

The patient has never before been treated for her disease. A favourable effect of stimulation was observed already after a week's therapy. She became far more independent in her walking, dressing, and eating. The improvement recorded after a month was assessed as a very significant one. She was moving round the ward quite on her own, she was dressing herself and was using the spoon without anybody's help. Asynergy at sitting entirely disappeared. The muscular rigidity was clearly reduced. The contracture, i. e. the ulnar deviation of the metacarpophalangeal joints, was considerably less pronounced.

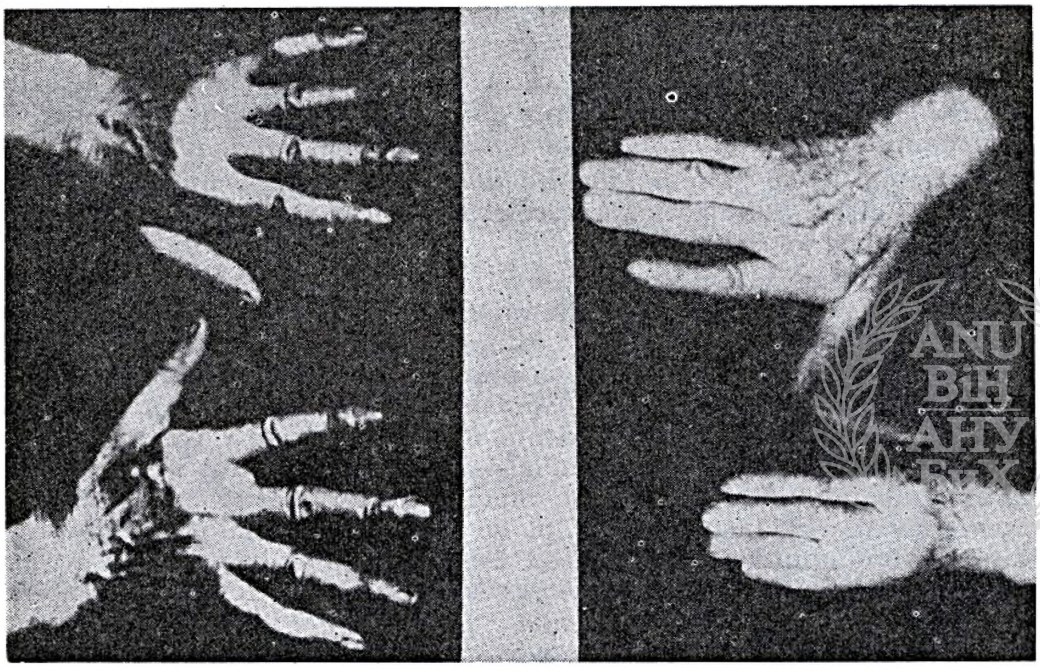

Fig. 1

The maximal finger abduction before and after a month of treatment.

Case 2: S. K., 73 years old male patient. He has developed Parkinson's syndrome, more markedly in the left extremities, in the last 5 years. His speech had been hardly intelligible in the last 2 years. Before the beginning of the therapy the patient could partly dress himself only by somebody's help. He was eating with difficulty and could not turn in bed easily. He was going out only if accompanied by somebody else.

The neurological findings on admission: A pronounced progravitation posture, strong propulsion, lack of associated movements, walking »à petit pas«. A markedly prolonged beginning of movements. Rigidity was more severe in the left than in the right side. Swallowing was impaired. Speech was slow and hardly modulated. He was not able to pronounce whole sentences but only individual words.

After 24 stimulations the therapy was interrupted. The patient was able to dress without anybody's help and to walk 3—4 kilometres. His speech became far more intelligible: practically, every word was clearly pronounced. Along with receded difficulties in swallowing, pseudohypersalivation disappeared too.

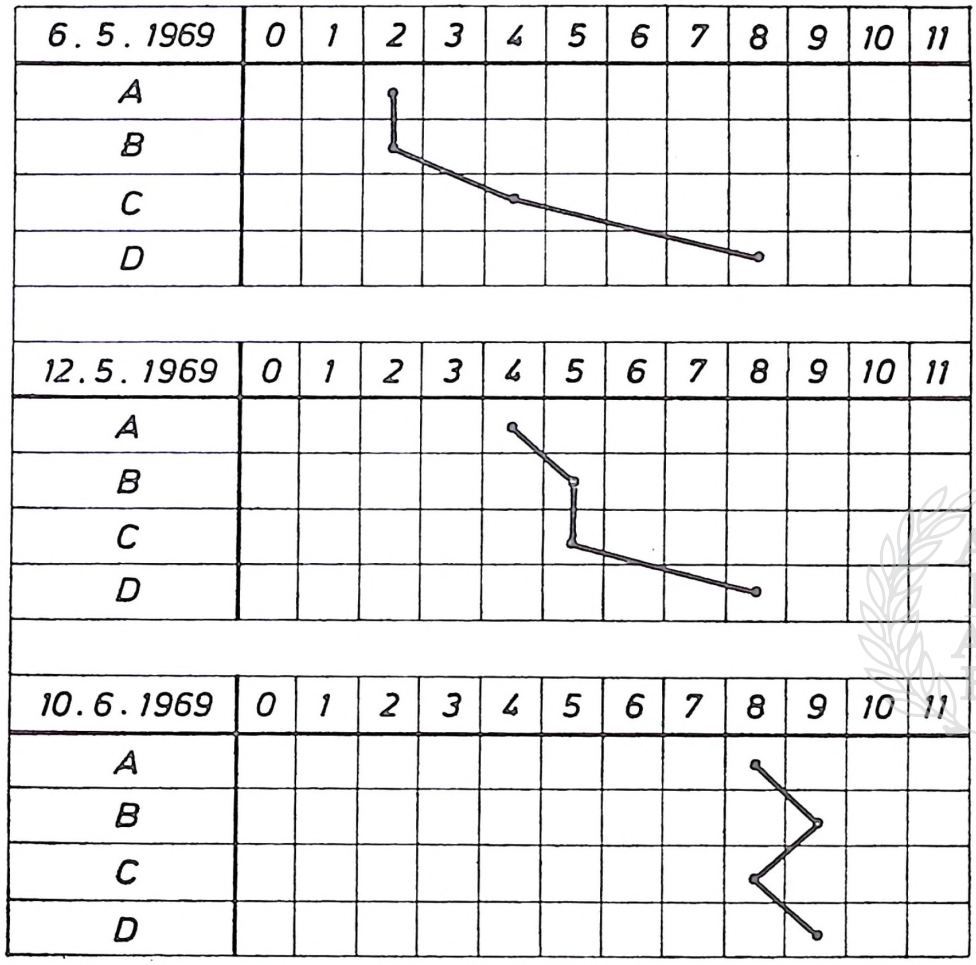

Fig. 2

Case 3: P. T., 50 years old, male patient. A bilateral stereotactic operation was performed on the patient. His principal disorder was anarthria with impaired swallowing and pseudohypersalivation. In addition to the standard stimulation scheme, the laryngeal region and the region of the low facial musculature were stimulated as well. After the first stimulation the patient was already able to speak clearly with-out change in speech modulation and rhythm. He was able to

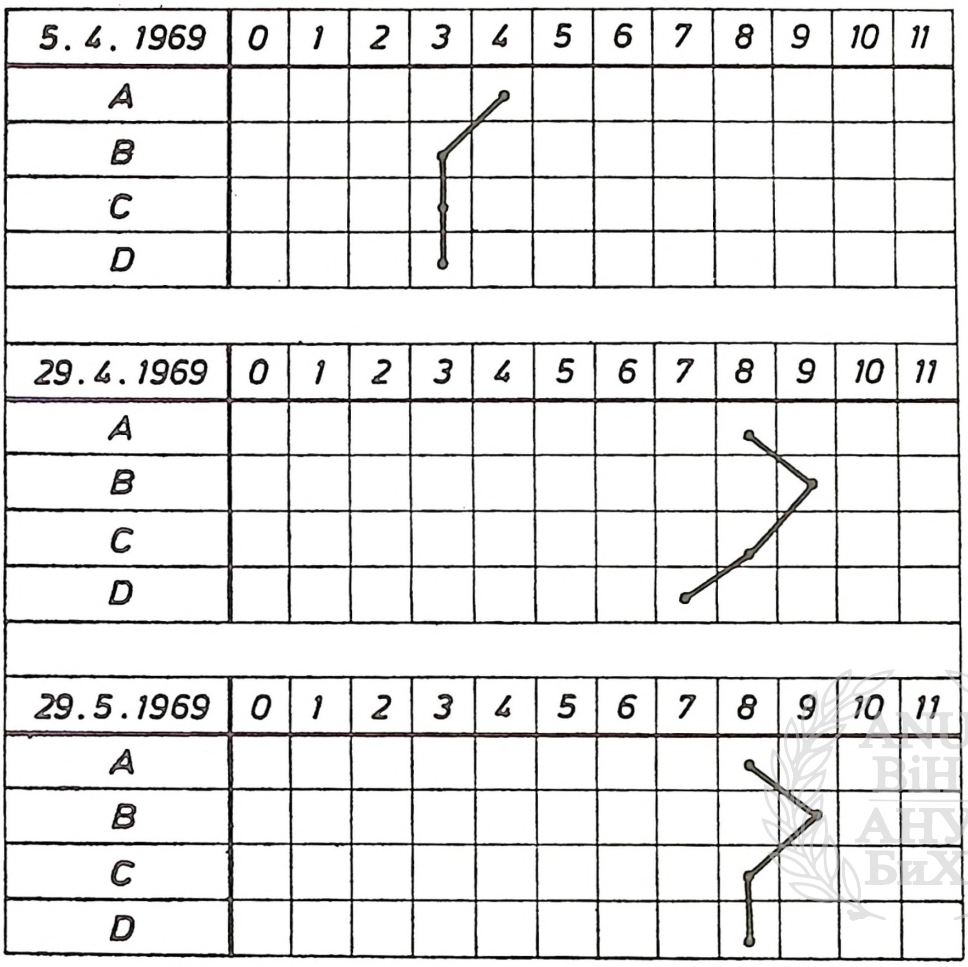

Fig. 3

pronounce not only individual words but also whole sentences. The effect lasted for more than one hour. After the second stimulation the duration of the positive effect was considerably shorter. After the third stimulation the positive effect did not develop at all.

DISCUSSION

These three cases were presented to show possible effects of alternating low frequency electrical stimulation on symptoms of Parkinson's disease, without pretension to analyse the whole group of patients on this occasion. We would like only to mention that results varied and

that in some cases the effect was negligeable. Rigidity and akinesias have often been reduced. There was almost no effect on tremor.

The theoretical basis of the therapy according to Hufschmidt (1) lies in »passing on information« to motor centres by repetitive electro-stimulation. Afferent impulses provoked by the direct stimulation of receptors have an advantage over voluntary efferent impulses which only secondarily stimulate receptors and quinckly lead to fatigue. The author of the method maintains that what is essential in the method is the excitement of the Golgi receptors which transfers the impulses transmitted through I b fibres to spinal interneurons. This interneuron system integrates impulses and transmits them to higher or lower segments and also to the contralateral musculature. The sensitivity of the spinal interneuron system in Parkinson's syndrome is considerably increased (Hufschmidt, 1960[3]).

Any movement disturbance, either due to a central or peripheral cause, results in a limited inflow of afferent information which keep the movement programming motor centre active. There are experimental data which show the importance of afferent information for motor function. Electrostimulation and the repetitive stimulation of the musculature reactivate the functionnaly impaired central organ for which afferent impulses are the basis of its functioning. This fact, however, puts a limit to this kind of therapy. The therapy is successful only if there is a functional collapse (break-down) of the centre. The organic defect remains. This is the rationale of the author of the method (1).

The positive effect of this therapy lasts, as a rule, longer than the »cure« itself. To prolong it, it is necessary to repeat stimulation from time to time. Repeated stimulation appears necessary because repetition is the basis of both the production and the maintenance of conditioned reflexes. Indeed, the production of negative conditioned reflexes might be the very factor responsible for the missing of any favourable effect on rigidity and akinesias at the beginning of stimulation. To which extent humoral changes accompany functional ones is a problem which may become the subject of very interesting studies.

A. JUŠIĆ, S. DOGAN I M. FRONJEK

EFEKTI NISKO FREKVENTNE MUSKULATURNE ELEKTROSTIMULACIJE NA EKSTRAPIRAMIDALNE SIMPTOME

KRATAK SADRŽAJ

H. J. Hufschmidt uočava povlačenje spasticiteta nakon tretmana niskofrekventnim električnim stimulansima. Prema njegovom mišljenju, efekat na spasticitet je baziran na stimulaciji Golgijevog organa, I b aferentnih vlakana i spinalnih interneurona. Kroz spinalne interneurone impulsi dospijevaju do kontralateralne strane ili se penju ka supraspinalnim strukturama.

U ovoj metodi upotrijebljena je dvostruka električna stimulacija sa intervalom od 1—1,5 ms. Intenzitet stimulacije je takav da izaziva vidljivu kontrakciju mišića.

Mi upotrebljavamo ovaj metod kod pacijenata sa Parkinsonovim sindromom. U većini slučajeva ovakav tretman je doveo do redukcije rigiditeta i do smanjenja hipokinezije. Nekog bitnog djejstva na tremor nije bilo. U nekim slučajevima čak je tremor postajao i jači.

Autori su prezentirali nekoliko slučajeva da ilustruju efekte.

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DISCUSSION

Bernard: Was electrostimulation therapy applied to patients already treated whith anti-parkinson drugs? Did classical treatment influence the results obtained by electrostimulation therapy?

Jušić: We did not stop the classical anti-parkinsonien therapy in the patient under the electrostimulation. The results were better in nontreated patients. The spetial attention should be paid to the third ptientt reported.