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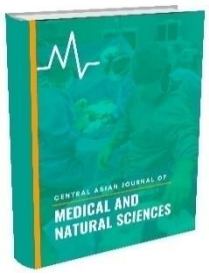

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Changes in SEP Indicators in Patients using rPMS in Muscle Hypotonia Syndrome

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Abstract: **The purpose of the research.** Study of changes in somatosensory evoked potensials indicators in patients using repetitive peripheral magnetic stimulation in muscle hypotonia syndrome.

In the period of 2022-2023, 110 children of early age (0-3) with muscle hypotonia syndrome were comprehensively examined in the department of "Childhood Nervous Diseases" of the 1st Children's Clinical Hospital of Tashkent City. In our research, we divided the patients with muscle hypotonia syndrome, that is, the representatives of each group (group 1,2,3,4) into 2 groups.

Representatives of the 1st group (47 people): traditional medical treatments, i.e. medical treatment ± rehabilitation. Medicinal treatment includes nootropic, blood circulation improving, acetylcholinesterase drugs and group B vitamins. Representatives of the 2nd group (63 people): rPMS ± rehabilitation. Treatment procedures were continued 10 days every month from 3 to 6 months. Patients underwent SEP examination before and after treatment.

In conclusion, rPMS± rehabilitation resulted in a significant and short-term reduction in the latency period of SEP peaks, an increase in the conduction of nerve impulses from the somatosensory pathway in response to stimulation of the n.medianus.

Even when rPMS was applied peripherally, significant efficacy was achieved in improving somatosensory cortical conductance in the SEP study of patients with central type of muscle hypotonia syndrome. Our results showed that since rPMS is the hub of spinal cord descending, ascending and segmental nerve signals, non-invasive rPMS has the ability to simultaneously change cortical, corticospinal, spinal cord motor activity and conductance and excitability in peripheral nerves.

Keywords: SEP, rPMS, the muscle hypotonia syndrome.

The purpose of the research. Study of changes in somatosensory evoked potensials indicators in patients using repetitive peripheral magnetic stimulation in muscle hypotonia syndrome.

Material and test methods. During 2022-2023, 110 children with muscle hypotonia syndrome at an early age (0-3) were comprehensively treated in the Department of "Childhood Nervous Diseases" of the 1st Children's Clinical Hospital of Tashkent City. Our study included 57 (51.8%) boys and 53 (48.2%) girls. All children were carefully examined clinically and neurologically according to the generally accepted method. The examined patients were divided into 4 groups according to the results of clinical and anamnestic, ultrasound, dopplerographic and electrophysiological examination.

Children with muscle hypotonia of central type (group 1) had 32 (29), children with MGS of peripheral type (group 2) had 25 (23), children with mixed, that is, MGS with damage of both central and peripheral type (3 -group) accounted for 43 (39%) and chromosomal diseases with muscle hypotonia (group 4) accounted for 10 (9%).

In our research, we divided the patients with muscle hypotonia syndrome, that is, the representatives of each group (group 1,2,3,4) into 2 groups. Representatives of the 1st group (47 people): traditional medical treatments, i.e. medical treatment ± rehabilitation.Medicinal treatment includes nootropic, blood circulation improving, acetylcholinesterase drugs and group B vitamins. Representatives of the 2nd group (63 people): rPMS ± rehabilitation. Treatment procedures were continued 10 days for every month from 3 to 6 months. Patients underwent SEP examination before and after treatment. The results were entered into the patient's medical history.

All patients underwent post-treatment SEP and compared with pre-treatment SEP results.

Table 1. Mean pre-treatment SEP score of patients receiving conventional medical treatments.

Groups	N9	N13	N20	P25	N9-N13	N9-N20	N13-N20
Group1	8,66	12,5	24,6	28,6	3,84	15,9	12
Group 2	8,88	16,2	19,3	25,05	7,32	10,42	3,1
Group 3	8,85	16,1	24,8	28,8	7,25	15,95	8,7
Group 4	7,3	13,9	24	28,8	6,6	16,7	10,01

According to the results of the scientific research, SEP examination of the patients who received traditional medical treatments before the medical treatments, the latent period of the N13, N20 and P25 peak in group 1 was on average 12.5±0.2ms (N13) and 24.6 ± 0.5 ms (N20) 28.6 ms (P25), the N9-N13 interpeak interval was 3.84±1.6 ms, the N9-N20 interpeak interval was 15.9±0.1 ms, and the N13-N20 interpeak interval was 12±1.2 ms ($P<0.01$), after treatment, the peak latency of N13 was 12.5±1.1, the latency of N20 was 24.3±0.4ms, and the latency of P25 was 28.2 ±0.4ms, N9-N13, N9-N20 and N13-N20 peak intervals showed 3.6±0.3ms, 15.4±0.3ms and 11.8±0.2ms respectively Table 1 .

Table 2. Mean post-treatment SEP examination of patients who received conventional medical treatments.

Groups	N9	N13	N20	P25	N9-N13	N9-N20	N13-N20
Group 1	8,9	12,5	24,3	28,2	3,6	15,4	11,8
Group 2	8,9	16	19,3	25,05	7,1	10,4	3,3
Group 3	8,8	15,71	24,5	28,5	6,9	15,7	8,8
Group 4	9,25	14,7	23,8	28,45	5,45	14,5	9,1

SEP examination of patients who received traditional medical treatment before treatment showed that the latency period of N13, N20 and P25 peak were on average 16±0.2 ms (N13) and 19.3±0.5 ms (N20) 25.05±0.2 ms (P25), N9-N13 inter-peak interval 7.1±1.6 ms, N9-N20 inter-peak interval

10.4±0.1 ms, N13-N20 inter-peak interval 3.3±1.2 ms (P<0.01), after treatment, the latency period of N13 peak was 12.78±0.1, the latency period of N20 peak was 18.95±0.4ms, the latency period of P25 peak was 25.1±0.4ms, N9-N13, N9-N20 and N13-N20 peak intervals showed 8.27±0.3ms, 10.45±0.3ms and 2.18±0.2ms, respectively.

In group 3, the latency period of N13, N20 and P25 peak was on average 15.7±0.2 ms (N13) and 24.1±0.5 ms (N20), 28.5±0.2 ms (P25), the N9-N13 interpeak interval was 6.9±1.6 ms, the N9-N20 interpeak interval was 15.7±0.1 ms, and the N13-N20 interpeak interval was 8.8±1.2 ms (P<0,01), after treatment the latency period of N13 peak was 16.4±0.1, the latency period of N20 peak was 25.3±0.4ms, the latency period of P25 peak was 28.5±0.4ms, N9 -N13, N9-N20 and N13-N20 interpeak interval showed 7.8±0.3ms, 16.7±0.3ms and 8.9±0.2ms respectively. In group 4, before conventional treatment, the following indicators were respectively 8.5±0.4ms (N13) 13.36±0.4ms (N20) 24.3±0.4ms (P25), 5.45ms (N9-N13), showed 14.5 ms (N9-N20), 9.1 ms (N13-N20), after treatment, the peak latency of N13 was 13.4±0.1, the latency of N20 peak was 24.4±0, 4ms, P25 peak latency was 27.9±0.4ms, N9-N13, N9-N20 and N13-N20 inter-peak intervals are 4.86±0.3ms, 15.8±0.5ms, 10.94 ±0.3ms.

Mean pretreatment SEP score of patients receiving rPMS± rehabilitation treatments.

Groups	N9	N13	N20	P25	N9-N13	N9-N20	N13-N20
Group 1	8,5	12,78	24,9	28,9	4,28	16,4	12,12
Group 2	8,5	16,77	18,95	25,1	8,27	10,45	2,18
Group 3	8,6	16,4	25,3	28,5	7,8	16,7	8,9
Group 4	8,5	13,36	24,3	27,9	4,86	15,8	10,94

The mean pre-treatment SEP test of patients who received rPMS± rehabilitation treatments, the latency period of N13, N20 and P25 peak in group 1 was on average 12.78±0.2 ms (N13) and 24.9±0.5 ms (N20) 28, 9±0.2 ms (P25), N9-N13 inter-peak interval was 4.28±0.6 ms, N9-N20 inter-peak interval was 16.4±0.1 ms, N13-N20 inter-peak interval was 12.12±1.2 ms (P<0.01), after treatment, the latency period of N13 peak was 12.6±0.1, the latency period of N20 peak was 18.95±0.4 ms, and the latency period of P25 peak was 25 ,25±0.4ms, N9-N13, N9-N20 and N13-N20 peak intervals showed 3.54±0.3ms, 10±0.3ms and 6.4±0.2ms, respectively.

In group 2, which received rPMS± rehabilitation treatments, the latency period of N13, N20 and P25 peak before treatment was on average 16.7±0.2 ms (N13) and 18.95±0.5 ms (N20), 28.5±0.2 ms ms (P25), the N9-N13 inter-peak interval was 4.28±1.6 ms, the N9-N20 inter-peak interval was 16.4±0.1 ms, and the N13-N20 inter-peak interval was 12.12±1 .2 ms (P<0.01), after treatment, the peak latency of N13 was 12.9±0.1, the latency of N20 was 19±0.4ms, and the latency of P25 was 25.25± 0.4ms, N9-N13, N9-N20 and N13-N20 peak intervals showed 3.8±0.3ms, 9.9±0.3ms and 6.1±0.2ms, respectively. In group 3, before the rPMS± rehabilitation treatment, the following parameters were respectively 16.4±0.4ms (N13), 25.3±0.4ms (N20), 28.5±0.4ms (P25), 7.8ms (N9-N13), 16.7 ms (N9-N20), 8.9 ms (N13-N20). Table 4.

Table 4. Mean post-treatment SEP score of patients who received rPMS± rehabilitation treatments.

	N9	N13	N20	P25	N9-N13	N9-N20	N13-N20
Group 1	9,06	12,6	19	25,25	3,54	10	6,4
Group 2	9,1	12,9	19	25,2	3,8	9,9	6,1
Group 3	8,9	13	19	24,9	4,1	10,01	6
Group 4	8,7	12,7	19,1	25,2	4	10,04	6,4

As a result of pre-treatment SEP examination in group 4 who received rPMS± rehabilitation treatment, N13 peak latency was 13.36±1.1ms, N20 peak latency was 24.3±1.1, P25 peak latency was 27.9±0.4ms, N9-N13, N9-N20 and N13-N20 inter-peak intervals were 4.86±0.3ms, 15.8±0.2 and 10.94±0.2ms, after treatment N13 peak latency was 12.7±1.1 ms, N20, P25 peak latency were 19.1±0.52 ms, 25.2±0.4 ms, respectively, N9-N13, N9-N20 and N13 -N20 interpeak interval were 4±0.3 ms and 10.04±0.2 ms, 6.4±0.35 ms, respectively. Table 4.

In conclusion, our patients treated with rPMS ±rehabilitation had significantly higher ENMG scores than those treated with conventional treatment.

rPMS± rehabilitation resulted in a significant and short-term reduction of the latency period of SEP peaks, an increase in the conductivity of nerve impulses from the somatosensory pathway in response to median nerve stimulation.

Even when rPMS was applied peripherally, significant efficacy was achieved in improving somatosensory cortical conductance in the SEP study of patients with centraltype of muscle hypotonia syndrome. Our results showed that since rPMS is the hub of spinal cord descending, ascending and segmental nerve signals, non-invasive rPMS has the ability to simultaneously change cortical, corticospinal, spinal cord motor activity and conductance and excitability in peripheral nerves.