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THERAPEUTIC PHYSICAL CULTURE IN NEUROCIRCULATORY DYSTONIA

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Abstract
Disorders of external respiratory function, vascular tone, and thermoregulation are known to be driven by dysfunction of the nervous and humoral systems in patients with neurocirculatory dystonia (NCD).

Introduction
Disorders of external respiratory function, vascular tone, and thermoregulation are known to be driven by dysfunction of the nervous and humoral systems in patients with neurocirculatory dystonia (NCD).

Objective
In this article, we sought to determine the effectiveness of therapeutic exercise (TE) and massage therapy (MT) in the treatment of this condition. We examined 108 women aged 19 to 40 years with NCD. Assessments were performed at hospital admission, at discharge, and one year later to evaluate long-term outcomes. Baseline Findings at Admission. At admission, patients exhibited alterations in the structure of the respiratory cycle, including incomplete inspiration, prolonged expiration, respiratory arrhythmia, and the appearance of accessory waves, among other features. Vasomotor disturbances were also observed, manifested as thermoasymmetry, the “amputation” sign (19%), and in 22% of patients, fluctuations of isothermal fields. The temperature difference between the shoulder and the hand averaged from 5.0°C to 9.8°C. The thermographic index (TI) ranged from 1.3 to 1.9, with recovery times of 40 to 60 seconds.

Materials and Methods
The developed protocol was grounded in the patients’ clinical status and complaints-air hunger, dyspnea during exertion and emotional stress-as well as spirometric findings: asymmetric breathing, tachypnea, low tidal volume, increased minute ventilation (MV), reduced oxygen utilization coefficient (KIO_2), impaired expiration on the Tiffeneau test, in addition to cardialgia, cold extremities, paresthesias, changes in skin color of the limbs (mottling), general weakness, and rapid fatigability.
Fifty-four patients in the intervention group followed our protocol, while the control group received standard care. After the treatment course, statistically significant improvements were observed: in 98.3% of patients, external respiratory function (ERF) and the structure of the respiratory cycle normalized; in 89.7%, respiratory arrhythmia and accessory waves diminished or disappeared.

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Minute ventilation decreased by an average of 2 liters ($p < 0.01$) alongside an increase in tidal volume (TV) to 488.048 ± 16.17. Vital capacity (VC) rose to 3342.71 ± 57.18, compared with baseline 2820.75 ± 73.22 ($p > 0.001$ [sic]).

Electrotherapy Method. Magnesium iontophoresis using sinusoidally modulated currents (SMC) was applied according to the following technique. The anode, configured as a "collar" electrode with an area of 120 cm², was placed over the cervical region ([sic: "CC1MCHIOB C4-4b3" in the source]) with 5% $MgSO_4$ as the medicament. The cathode, a bifurcated electrode (120 cm² each branch), was fixed over the renal projection areas. SMC were delivered in rectified mode. Work modes I and IV were used for 5 minutes each, at modulation frequencies of 100 Hz and 30 Hz, respectively, with a modulation depth of 75%.

Electrotherapy session parameters. The total duration of each procedure was 10 minutes. The current intensity was increased to the level of a moderate, painless vibratory sensation (≈ H–15 mA [sic]). The treatment course consisted of 10–12 sessions, administered every other day. Hydrotherapy. Patients were prescribed pearl–conifer baths using a modified technique with a custom technical device we designed to reduce water turbulence by decreasing the diameter of air bubbles. Notably, reports by other authors also indicate that attenuating the excessive mechanical component of pearl bath action enhances therapeutic efficacy. For each bath, one tablet of conifer extract was used. Water temperature was maintained at 34–35 °C, bath duration was 10 minutes, and the treatment course comprised 10–12 sessions, given every other day.

Results

After a single course of physiotherapy-regardless of whether hydrotherapy or electrotherapy was prescribed-most patients (75%) reported improved well-being and a reduction in arterial blood pressure. Complaints of headache, cardialgia, dizziness, general weakness, irritability, and sleep disturbances were virtually absent. In the control group, the pattern of complaints remained uniform, with no meaningful changes over the entire observation period. During longitudinal follow-up, mechanocardiography in Group 1 demonstrated a statistically significant decline from baseline arterial pressure values and their stabilization at a lower level. After 3–5 courses of physiotherapy, systolic blood pressure decreased by 16.2 mmHg and diastolic blood pressure by 12 mmHg (Table 1). In the control group, which received only pharmacotherapy, blood pressure did not change substantially.

Table 1. Dynamics of arterial blood pressure (mmHg) in patients who received physiotherapy during the first follow-up period.

Blood pressure metric	Baseline	After 1st physiotherapy course	6 months after 1st course	After 2nd physiotherapy course	At the end of year 3	VI
Peak systolic blood pressure	160.3 ± 2.0	149.7 ± 2.9	153.0 ± 2.1	146.1 ± 2.3	144.1 ± 2.1	<0.001
Average systolic blood pressure	136.1 ± 2.0	129.3 ± 2.2	134.1 ± 2.6	129.1 ± 3.3	129.1 ± 3.8	<0.01
Mean arterial pressure (MAP)	113.5 ± 1.5	106.6 ± 1.8	109.0 ± 2.7	103.8 ± 2.4	105.0 ± 2.8	<0.05
Average diastolic blood pressure	95.6 ± 2.1	86.5 ± 1.8	86.8 ± 1.9	82.5 ± 1.7	83.6 ± 3.9	<0.05

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Hemodynamic findings. In Group 1, after the physiotherapy courses, favorable changes were observed due to a significant ($p < 0.05$) reduction (by 21.4%) in the initially elevated cardiac output per minute (from 184.2*6 [sic] to 162.6 15.3% [sic] of the predicted value). Peripheral vascular resistance showed a downward trend.

Table 2. Presents the dynamics of arterial blood pressure (mmHg) in the control group during the dispensary follow-up period.

Blood pressure metric	Baseline	At 6–8 months of follow-up	At the end of year 3
Peak systolic blood pressure	**161,2+2,9**	**157,4+6,0**	**160,0+2,7**
Average systolic blood pressure	**137,0+2,1**	**134,4+4,9**	**141,0+1,9**
Mean arterial pressure (MAP)	**113,4+2,3**	**114+5,1**	**117,3+2,0**
Average diastolic blood pressure	**94,0+1,7**	**95,0+5,0**	**97,3+2,1**

Note. The statistical significance ($p > 0.05$) was calculated between baseline arterial pressure values and those at the end of the third year of follow-up, showing a 10.6% decrease (from 79.2 ± 4.2 to 68.6 ± 4.0% of the predicted value). As a result of these hemodynamic shifts, cardiac hyperkinesis diminished and vascular bed patency improved. Physiotherapy methods promoted more economical cardiac function. After the first course of hydro- or electrotherapy, the hypotensive effect and improvements in hemodynamic indices persisted for 2 to 5-6 months. Accordingly, within the first year of dispensary follow-up, two treatment courses were prescribed, with a six-month interval. Following the second physiotherapy course, the therapeutic effect lasted 6-8 months, and after the third course-up to one year. The treatment outcomes were approximately equivalent for hydrotherapy and electrotherapy. Based on subjective reports, the majority of patients preferred hydrotherapy. In the control group, which had been taking the same medications for several years, arterial pressure and hemodynamic disturbances did not change significantly over 3.5 years of follow-up. In the assessment of long-term outcomes of the prophylactic use of physiotherapy methods at 3.5 years, improvement was observed in 80% of patients in Group 1 and 33% in the control group. It should be noted that physiotherapy enabled dose reductions of concomitant medications in most patients. At repeated examinations and on questionnaires, some patients reported that they discontinued medications on their own for 2-4 months and felt well. In the control group, improvements were more often attributable to dose escalation or switching to another drug. Analysis of health-care utilization due to worsening of the condition revealed a substantial difference between Group 1 and the control group. During the year prior to physiotherapy, the average number of polyclinic visits per patient in Group 1 for health deterioration was -.13 * 0.02 [sic; likely 1.3 ± 0.2]. The use of physiotherapy reduced physician visits, and polyclinic attendance decreased 2.3-fold. In the control group, each patient visited a physician several times per year before follow-up due to worsening; over the subsequent three years of observation, the number of such visits increased 1.3-fold.

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Conclusion

Thus, the results of our observations indicate that physiotherapy methods should be more widely implemented within the dispensary follow-up system for patients with arterial hypertension, as they exert a pronounced hypotensive effect and improve systemic hemodynamic processes. Physiotherapy can also have a corrective influence on the quantitative aspects of pharmacotherapy. With regular preventive treatment of patients with hypertension over the first year of dispensary follow-up, no fewer than two physiotherapy courses should be administered, with intervals of up to four months. In the second year, one to two courses may be prescribed, spaced seven or more months apart; beginning with the third year of follow-up, one course per year may be performed.

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