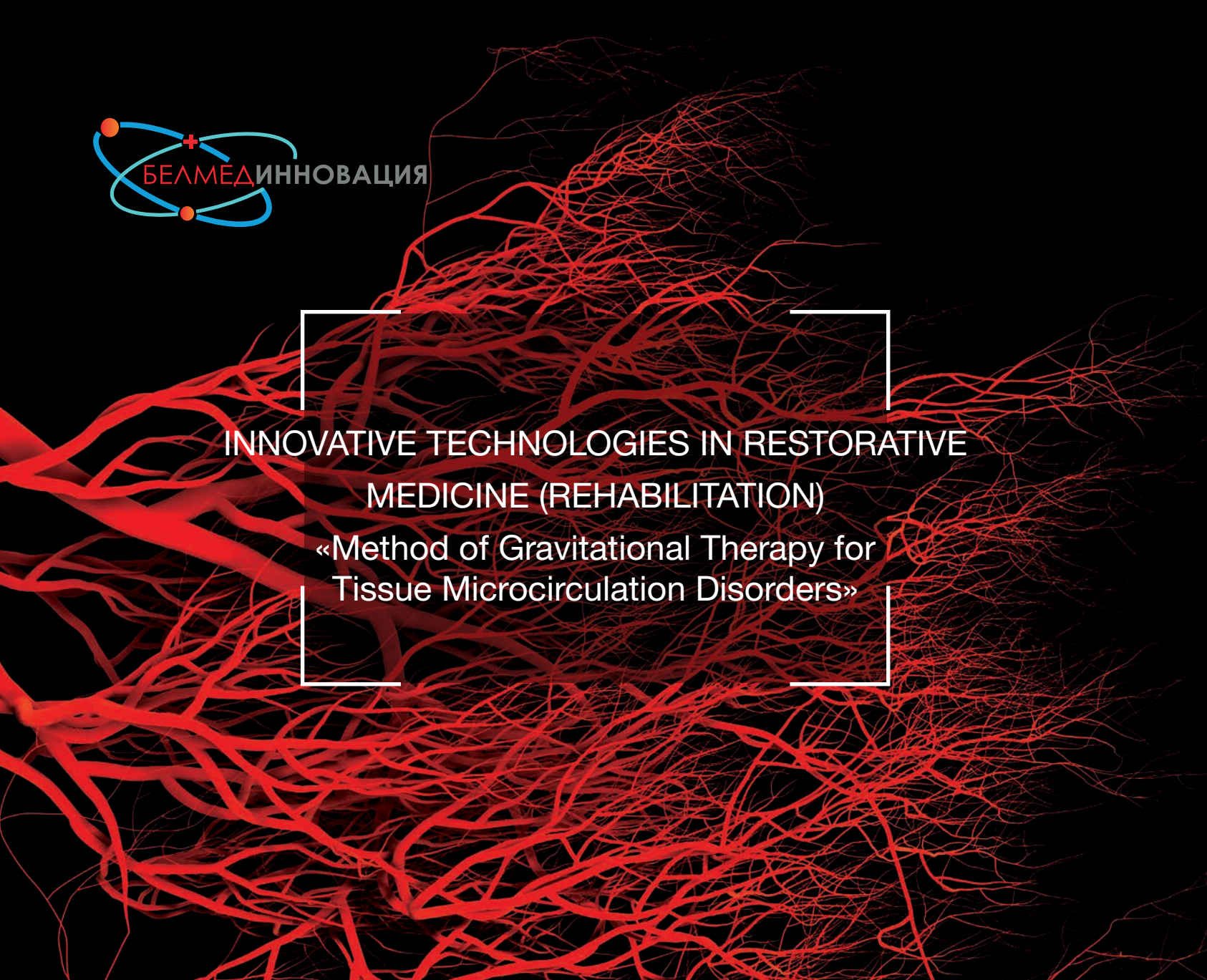
БЕЛМЕДИННОВАЦИЯ

INNOVATIVE TECHNOLOGIES IN RESTORATIVE MEDICINE (REHABILITATION)

«Method of Gravitational Therapy for Tissue Microcirculation Disorders»



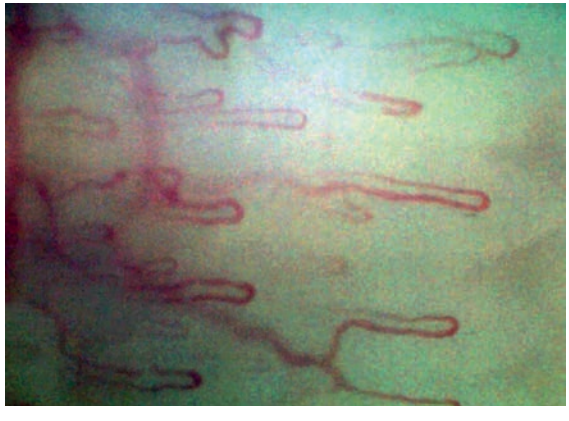
THE ESSENCE OF THE METHOD OF GRAVITATIONAL THERAPY FOR TISSUE MICROCIRCULATION DISORDERS

The patient is exposed to the simultaneous exposure to two natural physiological factors: mechanical oscillations within the bio-effective frequency range (specifically 0.1 Hz) combined with a smooth, reciprocating shift in the angle of gravitational force of up to 30 degrees toward the head and back. This intervention not only entails a redistribution of blood flow within the body but also synchronizes oscillatory processes. A further advantage of the method is the specific positioning of the patient, which prevents a sharp outflow of blood from the lower extremities.

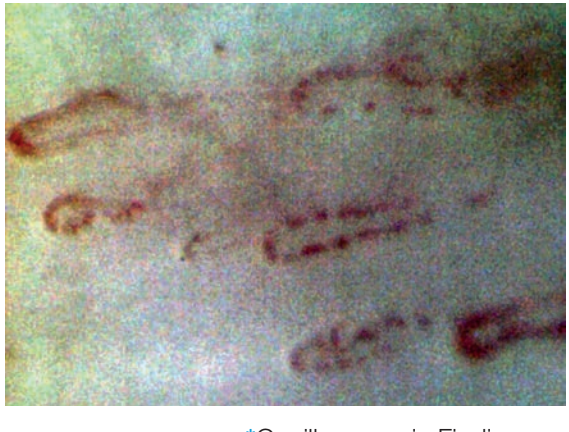
As a result, a continuous, wavelike change in perfusion pressure is induced, implementing a pattern of physiological vasomotor activity in the micro vessels. This elicits a response from the vessels of the microcirculatory bed in the form of synchronized vasomotor activity and an increase in capillary blood flow velocity.

The clinical effect is achieved through the synchronization of the vasomotor function of the microcirculatory bed and the improvement of tissue perfusion. This leads to an increase in the number of perfused capillaries (by recruiting reserve capillaries) in the organs and tissues of the upper part of the human torso, while also facilitating and accelerating venous return within the inferior vena cava system.

Normal Microblood Flow*



Microblood Flow in a Patient with Covid-19*



*Capillaroscopic Findings

PRACTICAL IMPLEMENTATION OF THE METHOD

The method is implemented using the certified medical device **Inversion Table for Therapeutic Patient Treatment TY BY 192389051.001-2015** (This device is an automated platform that executes movements according to a strictly defined algorithm). It has no direct equivalents on the market!

Marketing Authorisations:
Republic of Belarus: № ИМ-7.103706/2206 of 21.06.2022 (permanent)
Russian Federation: № РЗН 2022/19055 of 09.12.2022 (permanent)

PRINCIPLE OF OPERATION

The patient is positioned lying on their right side on the moving platform base, with limbs slightly bent at the knees. This specific posture is hemodynamically optimal, as it prevents a sharp outflow of blood from the lower extremities and inhibits the development of undesirable reflex reactions, such as vasospasm.

During the first 10-minute phase, the platform performs smooth, reciprocating movements at a bio-effective frequency of 0.1 Hz. This motion gradually tilts the patient head-up to a maximum angle of 30 degrees.

Over the subsequent 10 minutes, the patient is rhythmically returned to the initial horizontal position.

Throughout the procedure, the platform's movement includes minor compensating oscillations of up to 3 degrees along a plane perpendicular to its base.

Key hemodynamic parameters—Blood Pressure (BP), Heart Rate (HR), and Oxygen Saturation (SpO2)—are continuously monitored for the entire 20-minute session.

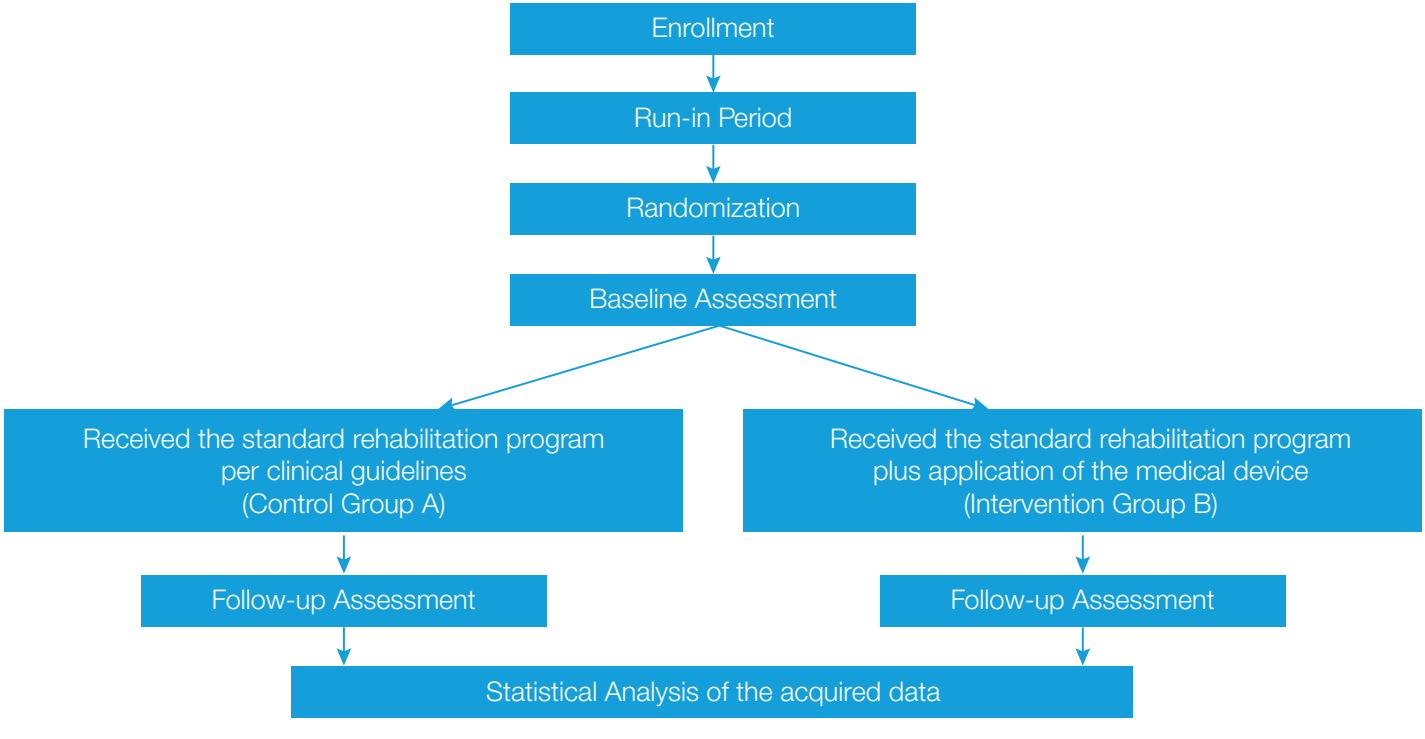
View of the medical device with a patient during the session (illustrative of positioning).

Session duration: 20 minutes.

RANDOMIZED CLINICAL TRIALS

Clinical trials for the medical device were conducted at the following sites: Republican Research and Practical Center for Pulmonology and Phthisiology, N.E. Savchenko Municipal Clinical Hospital No. 4, Minsk Municipal Clinical Hospital No. 10, Minsk Municipal Clinical Hospital No. 1, Minsk Regional Clinical Hospital, The Academician I.P. Pavlov First St. Petersburg State Medical University.

Trial Flowchart for each study group



DIAGNOSTIC COMPLEX (RESEARCH METHODS)

Collection of complaints, medical history, physical examination, and assessment of vital signs.

Clinical Study Cohorts

Patients aged 18 to 65 years with a medical history of:

- **Cohort 1:**
  Confirmed COVID-19.
- **Cohort 2:**
  Chronic Venous Insufficiency (CVI) of the lower extremities.
- **Cohort 3:**
  Grade II–III Arterial Hypertension (AH) and chronic heart failure, NYHA Functional Class I–III.

Trials were conducted separately for each cohort.

All patients within each cohort were allocated into two groups: an Study Group and a Control Group.

Clinical Trials

Cohort 1 (n = 100)

(Patients with confirmed COVID-19):

- Arterial Blood Gas Analysis (PaO_2 (%), SpO_2 (%), pH, BE mmol/L, $PaCO_2$ (%));
- Single-Photon Emission Computed Tomography (SPECT) (to confirm the method's pathogenetic impact);
- Cardiopulmonary Exercise Testing (CPET) with gas analysis;
- Laser Doppler Flowmetry with Occlusion Test;
- SF-36 Quality of Life Questionnaire;
- Modified Medical Research Council (mMRC) Dyspnoea Scale;
- Pittsburgh Sleep Quality Index (PSQI).

Cohort 2 (n = 60)

(Patients with Chronic Venous Insufficiency (CVI) of the lower extremities):

- Duplex Ultrasound Scanning of lower extremity vessels;
- Ultrasound of subcutaneous adipose tissue; morning and evening limb circumference measurement;
- CIVIQ-2 Quality of Life Questionnaire.

Cohort 3 (n = 70)

(Patients with Grade II–III Arterial Hypertension and CHF, NYHA FC I–III):

- Blood Pressure monitoring via 24-hour Holter monitoring with a stress test;
- SF-36 Quality of Life Questionnaire;
- Minnesota Living with Heart Failure Questionnaire (MLHFQ).

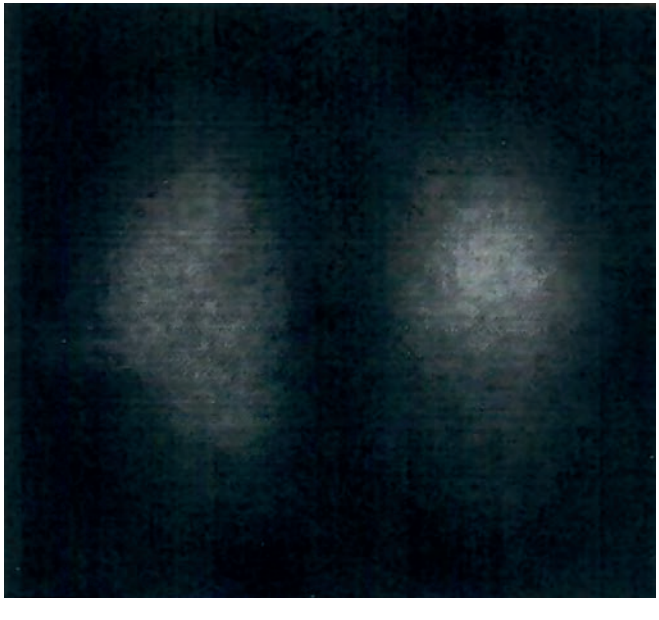
CLINICAL TRIAL RESULTS

Rehabilitation course duration: 10 days. **Session duration: 20 minutes per day.**

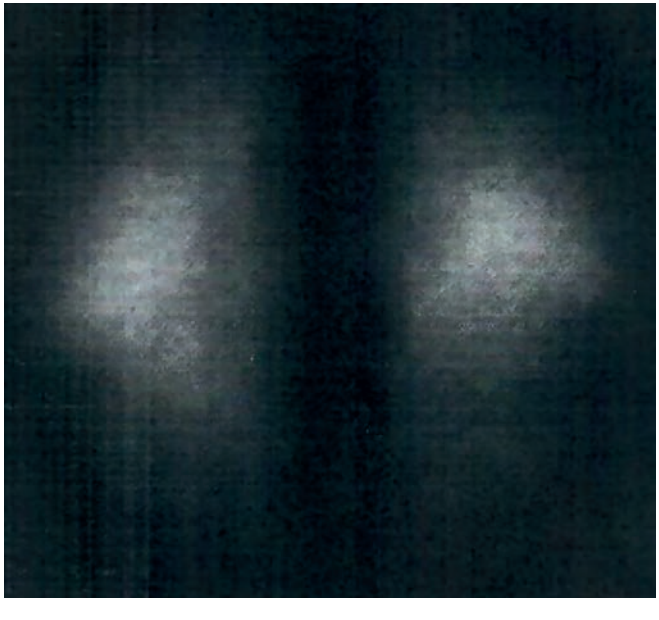
Control Group:
Standard rehabilitation program, in accordance with clinical guidelines, **plus daily sessions involving the practical application of the medical device.**

Study Group:
Standard rehabilitation program, in accordance with clinical guidelines.

Exemplary Lung SPECT Imaging of a Study Group Patient Before and After Rehabilitation



Baseline



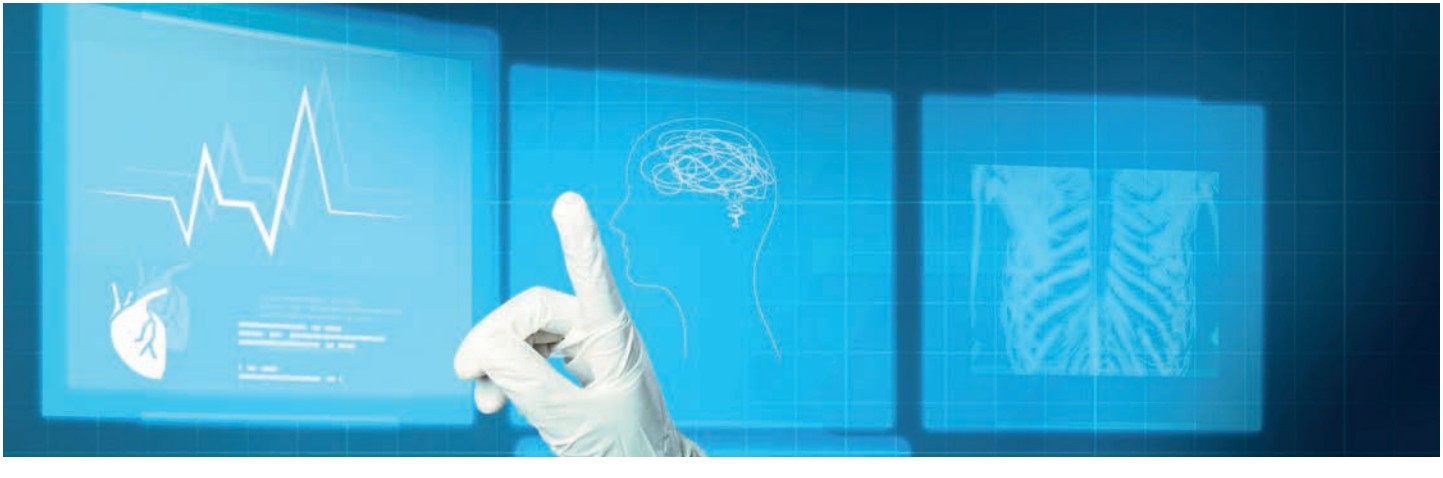
After the Course of Medical Device Use

Results of Single-Photon Emission Computed Tomography (SPECT) of the Lungs

№		Posterior Projection						Anterior Projection					
		Mean Microcircula-tion, %		max, %		min, %		Mean Microcircula-tion, %		max, %		min, %	
		Right Lung	Left Lung	Right Lung	Left Lung	Right Lung	Left Lung	Right Lung	Left Lung	Right Lung	Left Lung	Right Lung	Left Lung
Control Group													
1	before	83,73	88,80	135,90	162,20	14,90	7,80	94,90	67,70	203,31	160,50	24,80	5,60
	after	81,42	94,90	148,90	191,80	11,50	18,10	80,61	79,52	120,84	144,50	37,58	24,00
2	before	52,39	67,58	398,30	419,30	4,40	11,90	93,26	85,60	190,00	160,00	24,40	19,60
	after	81,80	90,53	124,10	154,70	21,61	12,20	80,02	71,70	164,00	176,00	26,10	7,03
3	before	92,50	86,40	128,18	185,37	6,30	6,60	80,60	64,70	129,80	164,20	19,80	19,50
	after	89,85	77,25	126,90	186,82	10,20	3,50	84,50	66,50	168,80	191,50	12,05	15,10
4	before	75,10	71,20	116,00	129,80	12,80	2,90	65,80	64,40	120,00	144,00	17,50	6,30
	after	94,90	108,00	125,00	148,80	9,10	4,80	69,90	65,80	163,90	143,90	8,10	9,40
5	before	71,20	78,70	138,00	111,00	5,80	19,50	64,80	82,65	198,00	232,50	3,70	1,30
	after	76,60	88,80	122,30	205,20	8,70	6,10	78,12	78,90	219,10	168,60	20,21	7,60
6	before	65,40	52,60	133,00	133,90	10,30	2,70	74,60	48,47	383,00	129,00	17,00	2,50
	after	65,80	49,30	192,50	112,50	14,80	12,60	61,13	50,90	221,70	197,70	22,30	17,00
7	before	88,90	77,00	199,00	112,40	23,00	4,40	73,70	63,90	145,20	100,90	34,70	34,90
	after	96,20	100,40	167,30	243,10	25,00	4,50	77,34	71,53	137,70	136,30	28,19	30,90
8	before	77,97	70,27	113,00	118,00	12,50	8,90	85,54	69,87	170,90	117,00	9,10	14,00
	after	80,38	72,70	137,50	130,90	15,01	9,30	83,90	76,80	157,90	143,60	21,90	32,24
9	before	78,30	84,30	148,10	192,60	4,30	2,10	68,60	77,70	145,30	164,40	7,80	17,50
	after	75,80	71,20	140,00	138,20	0,30	1,00	74,50	69,60	150,00	137,70	1,90	2,40
10	before	73,10	68,30	146,90	120,58	6,00	11,50	79,24	66,25	153,30	147,60	15,70	15,40
	after	82,50	62,80	123,40	186,10	8,40	1,00	68,92	67,18	170,10	160,30	7,10	11,80
Study Group													
1	before	101,80	95,50	156,40	179,80	12,60	3,10	77,14	74,48	158,90	124,80	29,90	24,70
	after	77,10	74,48	130,30	147,10	16,28	10,80	66,88	55,00	159,30	136,10	3,20	4,10
2	before	90,47	90,46	136,50	204,70	6,70	2,40	73,16	71,70	150,40	175,80	28,10	11,80
	after	103,90	96,05	187,46	177,68	9,20	4,90	69,96	70,40	127,70	146,40	17,02	11,80
3	before	88,38	91,57	119,48	205,59	9,70	5,28	79,55	75,67	205,40	139,30	12,76	25,03
	after	87,25	80,70	119,36	126,80	23,90	5,73	67,21	47,83	147,48	133,07	5,67	5,31

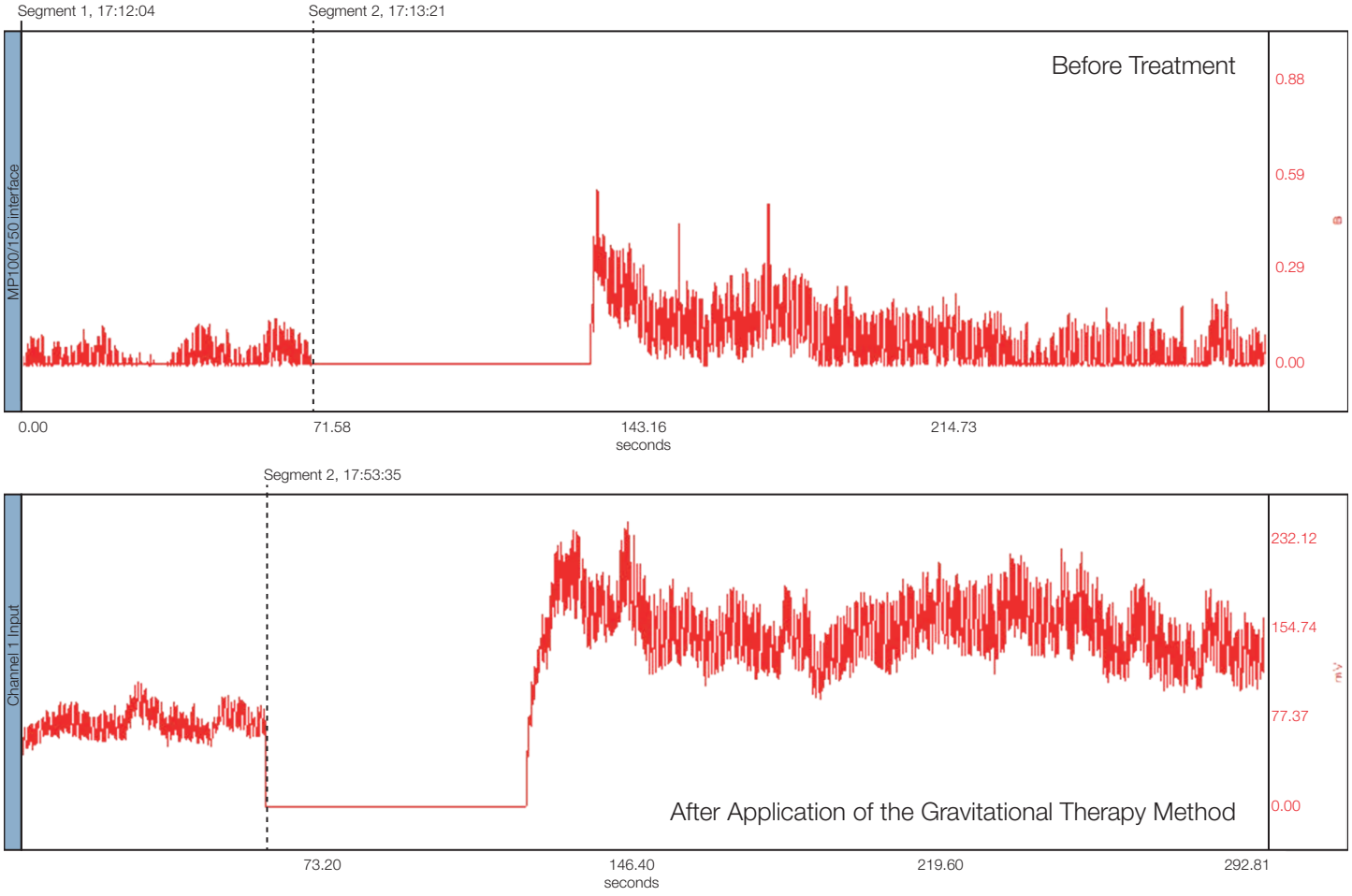
Cardiorespiratory Exercise Testing Results

№	Before Rehabilitation		After Rehabilitation	
	V'O2, L/min/kg	Workload (MET)	V'O2, L/min/kg	Workload (MET)
Control Group				
1	28	8,5	26	9,0 (+0,5)
2	24	8,0	28 (+4)	8,7 (+0,7)
3	19	5,7	18	5,5
4	15	5,0	19 (+4)	6,0 (+1,0)
5	15	5,9	20 (+4)	6,5 (+0,6)
6	11	3,8	11	3,8
7	13	4,5	14 (+1)	4,6 (+0,1)
8	23	7,5	25 (+2)	7,7
9	9	4,1	17 (+8)	5,6 (+1,5)
10	28	7,3	22	6,7
Study Group				
1	12	4,3	12	4,6 (+0,3)
2	15	5,4	16 (+1)	5,2
3	12	4,3	11	4,2

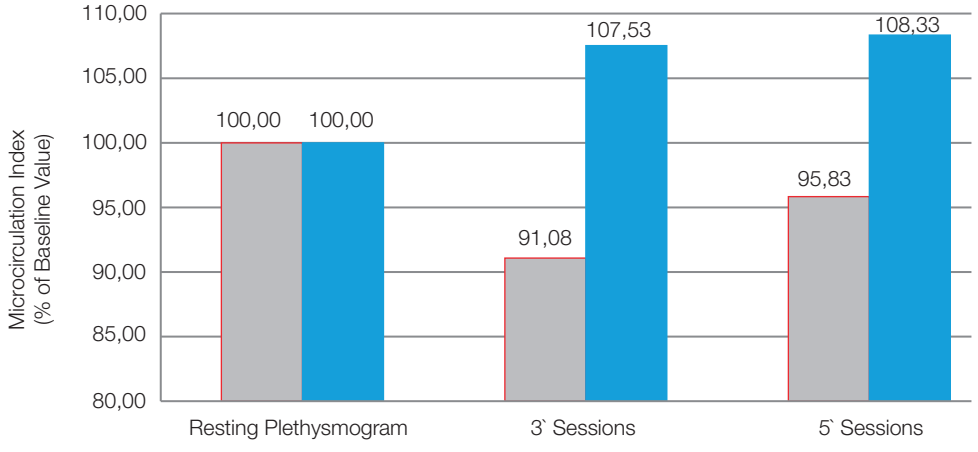


Increase in Post-Occlusive Blood Flow Following a Rehabilitation Course Involving the Application of the Medical Device

(Laser Doppler Flowmetry Data)



Change in Microcirculation Parameters During an Occlusion Test Before and After the Rehabilitation Course



MI = $N_{эр}$ × $V_{ср}$

where:

$N_{эр}$ – Number of Erythrocytes in the Sampled Volume,

$V_{ср}$ – Mean Erythrocyte Velocity

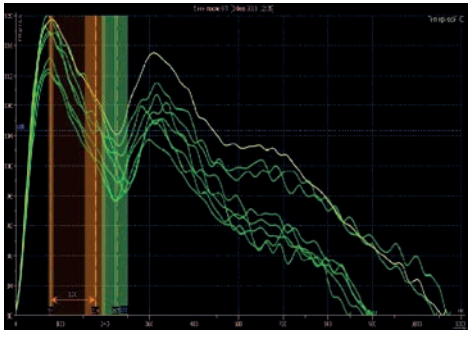
Before Rehabilitation

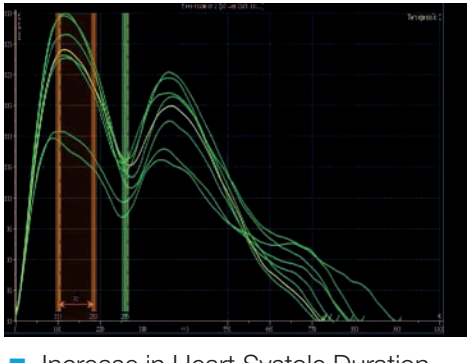
After Rehabilitation

Resting Plethysmogram Before and After Application of the Medical Device

(Data from the «ANGIOSCAN-01» Device)

Before



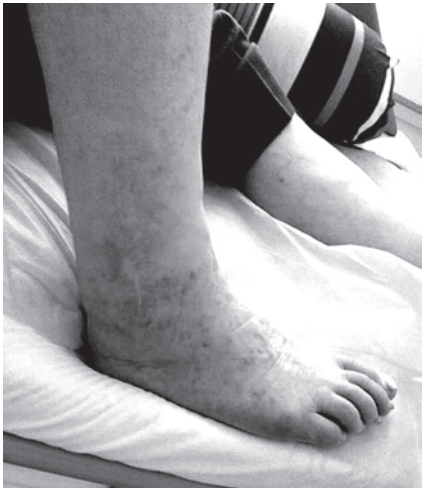


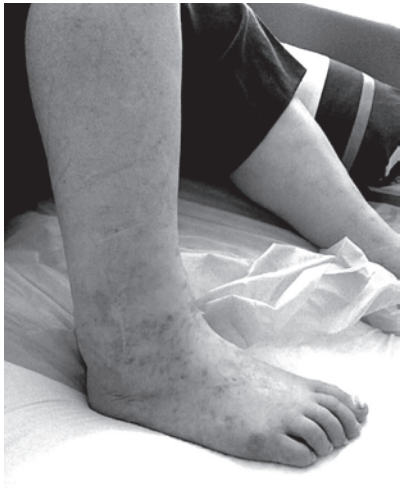
After

- Increase in Heart Systole Duration
- Reduction in Arterial Stiffness Index

Visual reduction in limb oedema volume and reduction in hyperpigmentation

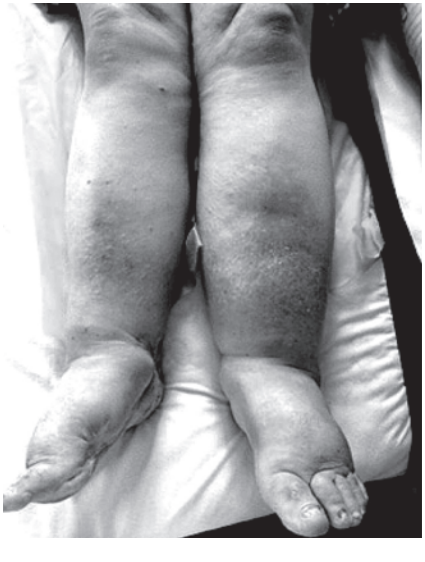
CVI in Post-Thrombophlebitic Syndrome (PTS) (Before Treatment)

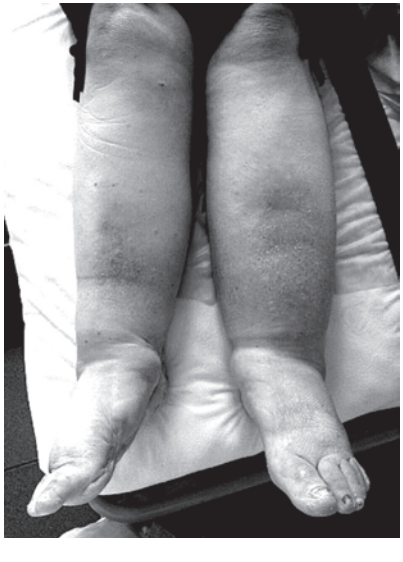




CVI in Post-Thrombophlebitic Syndrome (PTS) (after a treatment course using the medical device)

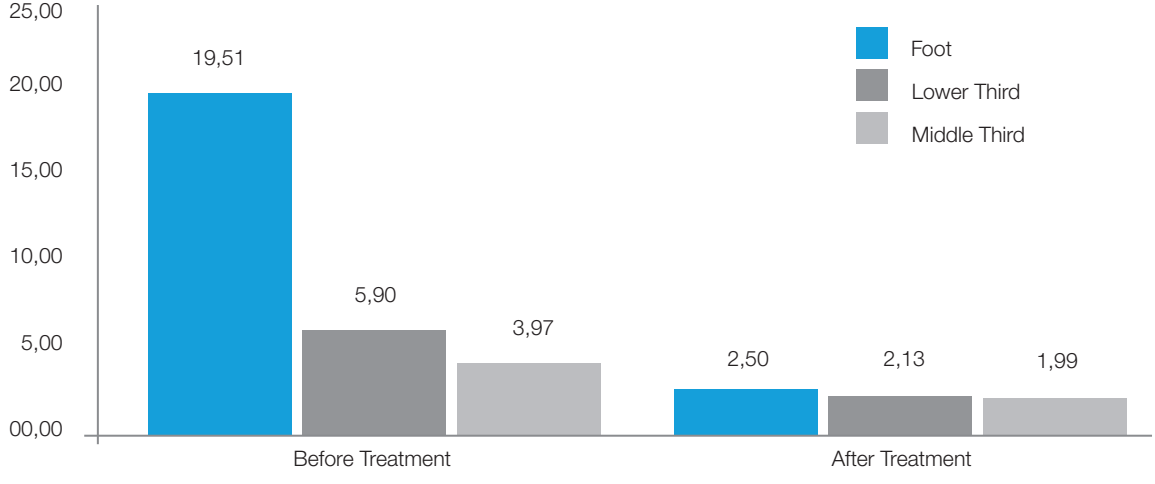
CVI, Diabetic Angioneuropathy of the Lower Extremities (Before Treatment)





CVI, Diabetic Angioneuropathy of the Lower Extremities (after a treatment course using the medical device)

Changes in Lower Limb Circumferences (%) before and after the rehabilitation course with the medical device



Dynamics of Lower Extremity Venous Ultrasound Duplex Scanning Parameters in the Study and Control Groups (mm)

Parameter	Control Group		Study Group	
	Before Treatment (n=18)	After Treatment (n=18)	Before Treatment (n=18)	After Treatment (n=18)
Diameter of the GSV Ostium (±m)	6,13 (±0,24) *	4,50 (±0,18) *	5,16 (±0,21) *	5,20 (±0,21) *
Diameter of the GSV Trunk at the Mid-Thigh (±m)	3,92 (±0,16) *	3,16 (±0,13) *	3,91 (±0,16) *	3,90 (±0,16) *
Diameter of the SSV Trunk at the Mid-Calf (±m)	3,90 (±0,16) *	3,15 (±0,13) *	3,50 (±0,14) *	3,50 (±0,14) *

Note: * p <0.05 (statistically significant differences before and after treatment within the study group).

Ultrasound duplex scanning of the lower extremity veins in the study group revealed a significant reduction in the diameter of the great saphenous vein (GSV) ostium and trunk, and the small saphenous vein (SSV) trunk. The most pronounced reduction was observed in the diameter of the GSV ostium (from 6.13 mm to 4.5 mm), i.e., by 26.59%.

CONFIRMED CLINICAL EFFECTS OF THE GRAVITATIONAL THERAPY METHOD

(Based on results from randomized clinical trials of the medical device)

Restoration of lung diffusion capacity in patients with Covid-19.
Improvement in gas exchange parameters and reduction of dyspnoea (based on arterial blood gas analysis showing an increase in PaO_2 in nearly 80% of patients, an increase in SpO_2; SPECT results; assessment of dyspnea severity using the mMRC questionnaire).

Improvement in microcirculation.
Increase in blood flow reserve (gain in the mean microcirculation index) based on occlusion test results using laser Doppler flowmetry.

Improvement in the drainage function of the lymphatic and venous systems of the lower extremities, manifested as a reduction in lower limb oedema and a decrease in the diameter of the main superficial venous trunks.
Results from ultrasound duplex scanning, subcutaneous tissue ultrasonography, and lower limb circumference measurements.

Reduction in arterial blood pressure.
Results of BP monitoring before and after the treatment course, including with a stress test.

Increased exercise tolerance.
Results of cardiorespiratory exercise testing.

Improvement in patient quality of life.
Results from the non-specific SF-36 questionnaire.

Improvement in sleep quality.
Results from the Pittsburgh Sleep Quality Index (PSQI).

ADDITIONAL PATIENT-SELF-REPORTED OUTCOMES

According to the survey, a significant proportion of patients reported:

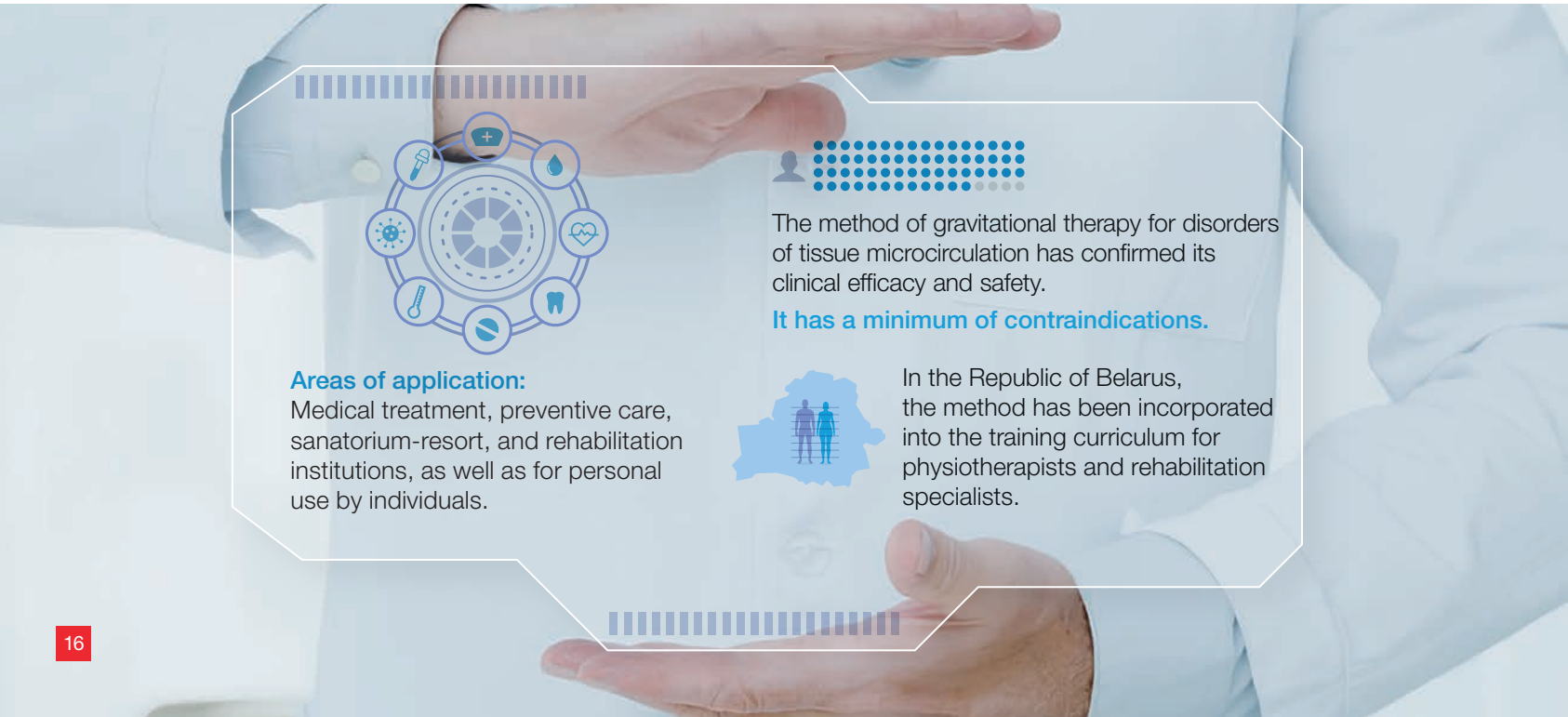
- Reduction or disappearance of tinnitus;
- Reduction in pain in the lumbar spine region;
- A sensation of "lightness" or reduced heaviness;
- Improved work capacity;
- Reduction in muscle pain (myalgia);
- Improved sleep quality.

EXPECTED THERAPEUTIC EFFECTS FOR PATIENTS:

- Improvement in lung functional status, leading to improved gas exchange and reduced dyspnoea.
- Reduction in lower limb oedema and decreased diameter of the main superficial venous trunks.
- Reduction in arterial blood pressure.
- Increased exercise tolerance.
- Improvement in microcirculation.
- Reduction in pain in the lumbar spine region.
- Improvement in quality of life.

CONTRAINDICATIONS

Acute and critical conditions.
Malignant neoplasms, active-phase pulmonary tuberculosis, acute inflammatory diseases of internal organs, hypovolemia, pulmonary diseases in the acute stage, acute myocardial infarction, atrial fibrillation or frequent extrasystole, chronic phlebothrombosis and thrombophlebitis of the lower extremities, presence of stenosis in blood vessels of various locations, and pregnancy. Treatment on this equipment is strictly prohibited for: patients under the influence of alcohol or narcotics, as well as patients suffering from psychiatric disorders.



Areas of application:
Medical treatment, preventive care, sanatorium-resort, and rehabilitation institutions, as well as for personal use by individuals.

The method of gravitational therapy for disorders of tissue microcirculation has confirmed its clinical efficacy and safety.

It has a minimum of contraindications.

In the Republic of Belarus, the method has been incorporated into the training curriculum for physiotherapists and rehabilitation specialists.

Practical Applications of the Medical Device

This medical device can be effectively utilized within various comprehensive wellness programs, including:

- Recovery from a previous COVID-19 infection (**post-COVID syndrome**): Improvement of lung diffusion capacity, reduction of shortness of breath (dyspnoea), enhanced gas exchange, increased tolerance to physical exertion (restoration of physical strength), and improved quality of life.
- Rehabilitation of patients with cardiovascular diseases, such as **chronic heart failure and arterial hypertension**: Reduction of arterial blood pressure, improved quality of life, restoration of physical strength, and enhanced role functioning.
- **Treatment of venous insufficiency** («Light Walk»). Improvement of the drainage functions of the lymphatic and venous systems in the lower extremities, reduction of lower limb oedema, and decrease in the diameter of the trunks of the main subcutaneous veins.
- **Enhancing exercise tolerance** («Sports Rehabilitation»). Reduction of the arterial stiffness index, increase in blood flow half-recovery time (T1/2), and improvement of microcirculation indicators.
- «Active Living» within the framework of anti-aging medicine.
- **Improvement of microcirculation**. Enhancement of systemic circulation and promotion of lymphatic drainage.
- **Improvement of sleep quality** («Healthy Sleep»), among other applications.

Furthermore, international scientific and clinical data support its use for:

- Dorsopathies: subacute and chronic back pain, herniated intervertebral disc, and discogenic diseases of the lumbar spine.
- Spinal deformities of neurogenic origin.
- Obstructive arteriopathies.

Source: Dynamic Inversion Therapy in Clinical Practice, 2nd Edition, Revised and Expanded: Scientific and Methodological Recommendations / Edited by Professor G.N. Ponomarenko, MD, PhD [et al.]. — St. Petersburg, 2025. — 20 p.

To date, over 20,000 individuals have successfully completed a restorative therapy course using this device.

The medical device is included in the Republican Formulary of Medical Devices of the Republic of Belarus, which confirms its clinical efficacy, safety, and quality. It is also part of the standard training curriculum for physiotherapists and rehabilitation specialists.

The Ministry of Health of the Republic of Belarus has approved the instruction for use, «Method of Gravitational Therapy for Tissue Microcirculation Disorders» (December 18, 2023, No. 103-1123).

WITH OUR TECHNOLOGIES —
TOWARD HEALTH AND LONGEVITY!

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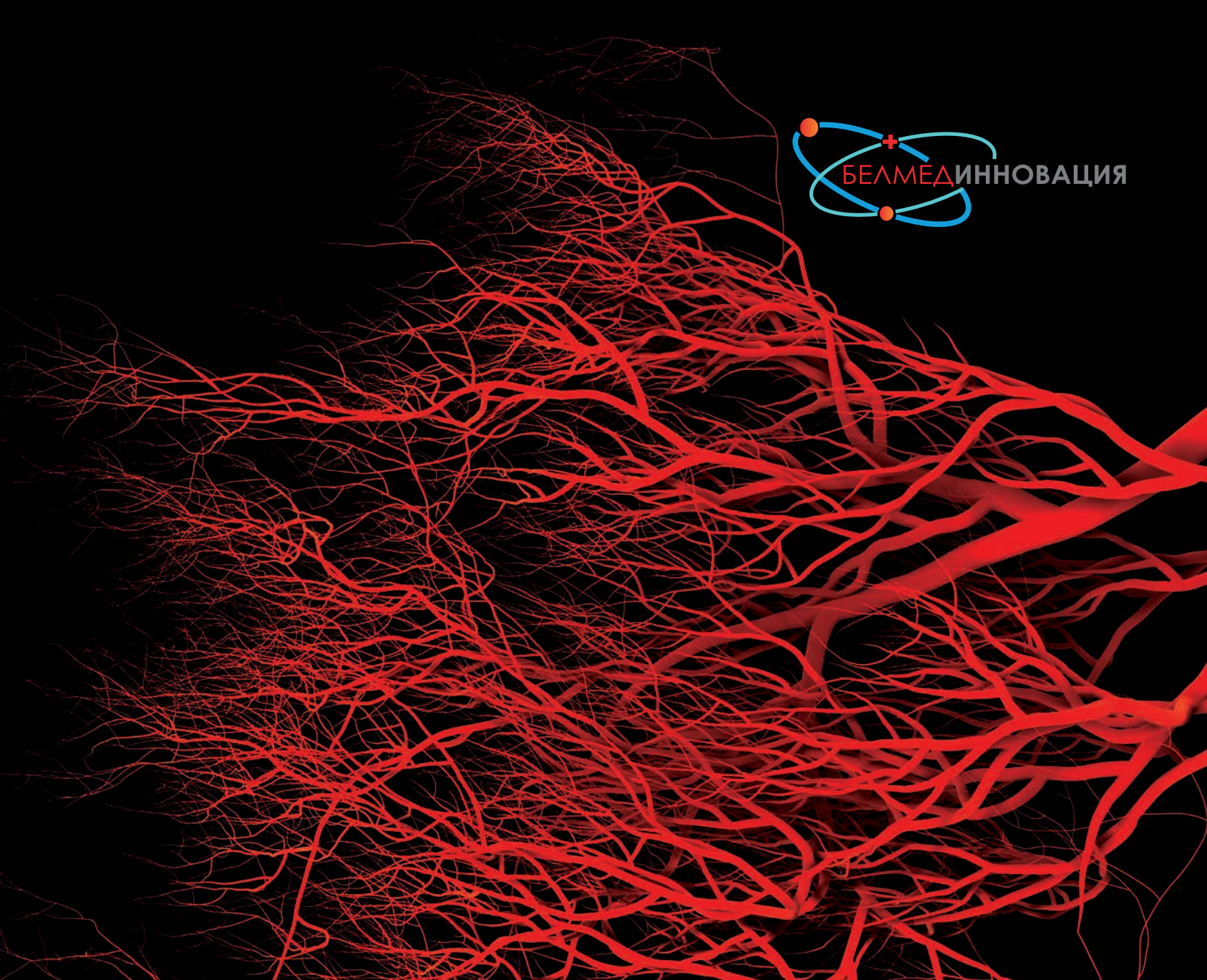
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