

# Literature

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This article should be cited as follows:

PORTNOV, V & Y. ZABELINA. Expectations and reality: first results of Hivamat 200 system clinical use in Russia. 2003

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## First clinical experience

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HIVAMAT-200 System (the name is composed of abbreviated words "his-tology" (HI), "variability" (VA), "manual" (MA) and "technics" (T)) makes it possible to carry out a new method of physiotherapy based on the action of pulsating low-frequency two-phase alternating electric field generated between therapist's hands and patient's skin. It is claimed, that movement of one of electrodes causes a moving of electrically neutral molecules in exposed tissues. The resulting dipoles rotate in accordance with changes in field polarity. This is accompanied by alternating elevations and depressions of corresponding zones at a preset frequency (ranging from 5 to 200 Hz) and development of intensive sympathetic vibration. Quick repetitions of this process cause rhythmic deformations of tissue leading to the effect of homogeneous massage. Depth of this effect ( $\leq 8$  cm according to German authors) depends on the properties of underlying tissues (depth of the effect decreases with increase in tissue density). The described changes cause dehydrating and antispasmodic effects, normalization of tone, as well as improvement in microcirculation and tissue trophism.

The apparatus was developed in the early eighties in the Department of Physiotherapy of Amberg Municipal Hospital (Germany) by physiotherapists Zeidel and Valdner. At present, HIVAMAT-200 is used in many clinics in Germany. A whole book of reports on this apparatus have accumulated by now. The PHYSIOMED GmbH company (Germany) is an exclusive manufacturer and vendor of these apparatuses. Several thousand apparatuses have been sold in the last eight years to customers not only in Germany, but in a number of other European countries as well.

According to publications of German authors, the indications for treatment with this method include:

1. Diseases of respiratory organs (bronchial asthma, bronchitis, mucoviscidosis, conditions after operations on lungs);
2. Diseases of cardiovascular system (arterial hypertension, disorders of venous circulation);
3. Diseases of nervous system (hemorrhagic or ischemic insult, craniocerebral injury, lumbalgia, ischialgia, pareses or paralyzes, motor aphasia, migraine);
4. Diseases and injuries of locomotor system (arthrosis, ankylosing spondylosis, epicondylitis, carpal tunnel syndrome, tearing of ligaments or muscles, fracture of spine, condition after osteosynthesis, sports traumas, hematomas, traumatic edema);
5. Surgical diseases (burns, trophic ulcers, lacerated wounds);

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6. Conditions after operative treatment of oncologic diseases (tumors of thy-roid gland, mouth floor, mammary gland, prostate or testes).

Contraindications include:

- acute infections;
- infectious diseases of skin;
- open tuberculosis;
- non-treated thromboses and vascular diseases;
- erysipelatos inflammation;
- non-treated malignant diseases;
- diseases of heart;
- cardiac pulse generators and other implanted stimulators;
- pregnancy;
- hypersensitivity to electric fields.

It is important to note, that the contraindications relate to both the patients and personnel, which deliver the treatment using special gloves. Presence of metal prostheses is not a contraindication for this treatment. In 1990 HIVAMAT apparatus was used in Russia in Lesgaft Institute of Physical Training and Institute for Postgraduate Training of Physicians (Lenin-grad). Treatment of portsmen with injuries of lower extremities on an outpatient basis resulted in stable pain control, decreased edema and increased volume of movements. Clinical, electrophysiologic and biochemical studies have demon-strated high efficacy of treatment of progressive muscular dystrophy with combi-nation of HIVAMAT System and medicamentous therapy (amelioration of dyski-nesias and increase in remission periods were noted). There are two different methods of HIVAMAT System application: treat-ment with special gloves and treatment using manual applicator. When the former method is used, therapist and patient shall be connected to opposite poles of the apparatus (polarity of connection plays no role). To carry out the treatment, therapist shall put on special gloves and make quick and slow movements along massage lines in accordance with stroking, chafing and petris-saging procedures. Treatment with a manual applicator shall be carried out by therapist without gloves or by patient himself or herself. For this purpose, one electrode shall be at-tached to patient, while the applicator shall serve as another electrode. The advan-tage of this method is in that the therapist is not connected to the apparatus. How-ever, dimensions of processed zone are limited, and massaging techniques can not be implemented in full.

To observe the requirements for sterility during treatment of open wound surfaces, the treatment procedure shall be carried out through special film. We have carried out the treatment of 22 patients (15 males and 7 females aged 45 to 74 years) with osteochondrosis of cervicothoracic or lumbosacral re-gions of spine with radicular syndrome during exacerbation phase (5); closed frac-ture of shin bones (3) and early post-operative period after aortocoronary shunting (14 patients).

Instructions and recommendations provided by manufacturers of the apparatus were observed during treatment. All patients were treated using the special gloves procedure. In patients with osteochondrosis, corresponding regions of spine and extremities were alternately treated with high (160 to 120 Hz) and medium frequencies (20 to 30 Hz) using 1:1 or 2:1 exposure to pause ratio, 50 to 60 % intensity and 15 to 30 min duration; a course of treatment included 5 to 15 sessions. Clinical alleviation of pain syndrome was noted already after one or two treatment sessions. There were no patients with aggravation of symptoms. Five to six sessions were sufficient for a course of treatment of patients with acute stage of the disease. Application of high frequencies to collar zone in patients with concomitant arterial hypertension resulted in clear hypotensive effect. In patients with fractures of shin bones the treatment was carried out in the region of fracture, as well as 10 cm above and 10 cm below the fracture, using the frequencies of 160 and 60 Hz alternately; each session lasted for 10 to 15 minutes, and one course of treatment consisted of 8 to 10 sessions. Treatment was carried out both pre- and post-operatively. Intensity of pain decreased already in the course of the first treatment session; quick decrease in edema and resolution of hematoma were noted.

As a part of the program of application of physical factors for rehabilitation of patients operated on for aortocoronary shunting at the in-hospital stage being developed by us at present, we applied the HIVAMAT System to thorax using the frequencies of 80 to 70 and 30 to 20 Hz alternately for preventing and treatment of hypostatic and hypodynamic disorders, as well as inflammatory processes in organs and tissues; some patients additionally obtained the treatment of extremities (at 160-60 Hz) to stimulate suture healing and accelerate the return of activity in conditions of complicated post-operative course. A 50 to 60 % intensity, 1:1 mode, 10 to 30 min treatment duration and 6 to 12 sessions in a treatment course were used. If the treatment had started on the second day after operation, such complications as hypostatic pneumonia, post-traumatic pleuritis or inflammation in the region of postoperative sutures were absent or their manifestations were reduced to minimum. Patients showed accelerated return to activity and post-operative adaptation. Clinical observations showed, that all 22 patients tolerated well this treatment; no side effects were noted during the treatment sessions. To obtain the objective confirmation of clinical results, we have conducted several trial studies. Single treatment sessions did not cause any changes in ECG parameters or blood flow in brachial artery. Study of microcirculatory reactions in tissues using a method of laser tissue Doppler flowmetry; oxygen tension in tissues in the treated region; and blood gases content after single treatment session or a course of treatment is underway. More than 200 treatment sessions have been conducted by now. No subjective signs of HIVAMAT System negative effects on therapist have been noted. This problem has not been discussed in the German literature. However, therapist and patient are connected to the same apparatus during the treatment session, and there is a need in objective data excluding or confirming any effects on physician of this procedure. Few examinations of microcirculation and oxygen tension in hand tissues covering 10- to 30-minute periods before and after the procedure, which have been conducted by us, did not reveal any changes.

Thus, our preliminary data enable us to state, that the described method has, undoubtedly, high potential of application in view of its ability to fight pain and edema, as well as its resorptive effect. Small dimensions and weight of the apparatus (2.5 kg), presence of built-in storage cell making it possible to carry out the treatment sessions without the need in

external power source, and simple operation make this apparatus appropriate for use during acute stage of diseases within emergency aid and during early post-operative period directly in wards. The main directions of our studies carried out at present include:

1. Clearing up the mechanism of curative effect of the method;
2. Excluding or confirming a clinically significant effect of the procedure on therapist;
3. Obtaining the objective data on responses of various body systems to single treatment sessions and courses of treatment in patients, and accumulation of sufficient data for drawing conclusions based on application of appropriate statistical methods.