

MINISTRY OF PUBLIC HEALTH REPUBLIC OF BELARUS

EDUCATIONAL INSTITUTION  
«GRODNO STATE MEDICAL UNIVERSITY»

L.A. PIROGOVA  
G.N. KHOVANSKAYA

**BASICS OF MEDICAL REHABILITATION AND  
NONMEDICAMENTAL THERAPY**

*Course of lectures*

Гродно  
ГрГМУ  
2009

УДК 615.82(075.8)

ББК 53.54я73

П-33

Authoresses: head of the medical rehabilitation and nonmedicamental therapy department IE «GrSMU», prof., L.A. Pirogova, M.D.;  
associate professor of the medical rehabilitation and nonmedicamental therapy department IE «GrSMU», G.N. Khovanskaya, PhD.

Reviewer: associate professor of the propaedeutics of internal diseases department IE “GrSMU”, T.P. Pronko, PhD.

Translator: postgraduate of the medical rehabilitation and nonmedicamental therapy department IE «GrSMU», A.I. Mazur;  
resident of the medical rehabilitation and nonmedicamental therapy department IE «GrSMU», A. Elguzali;  
department of foreign languishes IE «GrSMU».

**Пирогова Л.А.**

П-33 Basics of medical rehabilitation and nonmedicamental therapy : manual /  
L.A. Pirogova, G.N. Khovanskaya. – Гродно. ГрГМУ, 2009. – 48 с.

*The manual represents like lectures course, help medical students to study basics of medical rehabilitation and nonmedicamental therapy.*

*The manual will be useful and interesting to the physicians of all specialties and to the specialists in rehabilitation medicine.*

**УДК 615.82(075.8)**

**ББК 53.54я73**

## CURRENT APPROACHES TO THE PATIENTS AND INVALIDS REHABILITATION

One of the most actual and complicated problem in today's society is the rehabilitation of patients and disabled persons, i.e. the system of:

- governmental,
- socioeconomic,
- medical,
- professional,
- pedagogic,
- psychological procedures

directed at the:

- prevention of development of the pathological processes, leads to temporary or permanent disability;
- effective and early return of the patients and invalids, children and adults in to society and socially useful work.

The sense of word “rehabilitation” (*lat. re* - renewal, *habilitas* - ability, suitability; i.e. restoration ability to something) in general describe essence of conception and don't allow accept literal translation as definition.

Moreover, term “rehabilitation” is often used not only in medicine but in judicial practice (restore someone to former privileges or reputation after a period of critical or official disfavor).

Rehabilitation as same as therapy it acts on objective processes. For this reason it must be to consider rehabilitation as approach method to the patient and methods that can influence on him.

Rehabilitation beside its medical aspects contains other ones, vocational fitness examination, selection of profession, efficient job placement, social services; get access to technical facilities of rehabilitation.

Therefore, in the law of “Prevention disability and rehabilitation of invalids” 1994, mark out four types of rehabilitation.

**1. Medical rehabilitation:** complex of measures carries out in:

- hospital,
- polyclinic,
- health resort stages of it organization.

Directed to:

\* cure the outcome of trauma or sickness and compensation patients' functions,

- \* prevention of complications, chronicity and disease relapse,
- \* adaptation patient or disabled person to self-service and labor activity in new conditions determine by the illness or injury.

The medical stage of rehabilitation involves compulsory assessment of all clinical syndromes and correction them with different methods of rehabilitation.

Medical rehabilitation (MR) should be started from the acute phase of the disease and continue to get maximum results in elimination of physical, psychical and professional disturbances.

Rehabilitation can be started together with therapy or delayed but, never before it.

But there are specific differences between R than therapy:

- a) Therapy directed to etiologic and pathogenetic factors, while R - to complications of disease, mobilization compensatory mechanisms.
- b) Therapy directed at the organism today, while R – at the person and rush to the future.
- c) Therapy directed to elimination or compensation of concrete disease, R - always predicted rehabilitation potential and work prognosis.
- d) Therapy can be carried out passively, i.e. without patient participation, R - needs an active patient participation, positive motivation.
- e) Therapy usually based on nosological and syndromological diagnosis, while R based on functional one.
- f) R used training methods, i.e. during the time of amelioration different methods of rehabilitation with adequate load involved in.

It is not wise to switch rehabilitation to therapy when pathologic process progress and can leads to patient's death. Rehabilitation this case is meaningless.

By results of medical stage of R patient may be declare able to work or require methods of social rehabilitation, refer him to medico-professional or professional stage of R.

**2. Medico-professional stage of R:** undergo patients and invalids, which because of recent illness or injury have considerable difficulties of professional activity like:

- disability or
- decreasing.

Medico-professional R – process of vocational rehabilitation, matching medical R and professional orientation, examination of vocational fitness, qualified selection of new profession, occupational adaptation, psychological preparation and if necessary, assistance at rational job placement.

### **3. Professional R**

Professional R – is a system of measures, which prepare patient or invalid to labor activity. It consists of:

- education or reeducation at work place or in the educational institution;

- special suitable work equipments in working place;

- supply necessary technical facilities.

There are two aspects in professional R:

I. Arouse patient's resumption of labor activity readiness, increase and consolidate remaining abilities and functionalities that he can return to labor activity. This is joint task of attending medical doctor, rehabilitologist, psychologist, therapeutic physical training and ergotherapy instructors.

II. Creation the necessary prerequisites OTTH society for resumption labor activity of rehabilitate person, society moral education to it preparedness to include invalid to working process, in team life.

According to involvement in to working process patients divided in to three groups:

I. Person, who can return to his previous work in spare conditions.

II. Person, who can return to his previous work using aids only.

III. Person, who require a new place of work or another speciality.

**4. Social (psychosocial, everyday) R** restores main self-service skills and returns to society.

Social stage of R stipulates:

- invalids supply of auxiliary, household facilities;

- change of living conditions according to disease specifics;

- assignment means of conveyance;

- consultative, informational and social assistance;

- financial support.

An important place in rehabilitation has psychological aspect. Evidence of patent mental change, because of illness, injury or operation, depends not only on nature of pathologic process, but on patent

psychological status. It establishes necessity of differentiated psychological intervention.

Rehabilitation is divided into these groups only conditionally, but actually they are not dividable, they supplement, integrate each other.

Rehabilitation forms reproduce essence of measures carries out in public health service and other systems of national economy.

Rehabilitation is continuous process, according to WHO, divided in to 4 phases:

- hospital or therapeutic;
- polyclinic;
- sanatoria and health resorts;
- home.

There can be only 2 phases of rehabilitation: hospital, polyclinic. Besides phases order of priority can be changed. And it must be taken into account during rehabilitation program formation.

Hospital or therapeutic phase starts in acute phase of disease, in specialized, resuscitation or intensive care department.

The main aims of it are:

- estimation of the indications for rehabilitation, organism functional recourses,
- making an individual program of patient physical rehabilitation on starting stage,
- diagnosis and correction of psychological disorders,
- instruction of patient and his relatives to involve them into the rehabilitation process.

Some authors mark out in to hospital phase the mark out treatment-and-rehabilitation substep, it correspond to early period of reconstruction and include all patients that divided into 2 groups:

- Patients with beneficial clinical course. They have high rehabilitation potential, rehabilitation directed at decreasing duration of recovery period and time of temporary disability. The labour ability restoration takes place at hospital phase and present substep.
- Patients with different disease severity and different deadaptive syndromes, which requires more long-term medical rehabilitation.

Functions of polyclinic phase:

- To maintain and develop hospital therapeutics results.
- To prevent disease progress- secondary prevention.
- To define the level of disability.

- Job placement.
- To help in professional reorientation.

In the sanatoria phase of rehabilitation plan is composed individually i.e. according to patient condition, severity of trauma, psychic status, complications etc.

The sanatoria phase cannot identify with convalescence in whole.

Duration of stay in sanatoria is generally 21 days.

Function of sanatoria phase:

- To develop patient physical status to be fit for his work activities;
- Psychological re adaptation;
- Prepare patient to self-care life and work.

In this phase different physical rehabilitation methods can be used.

The main principles of Rehabilitation:

1. Early start.
2. By stages.
3. Individual programs.
4. Succession.
5. Continuity and duration of therapy.
6. Therapy complexity.
7. Rehabilitation accessibility to all needy patients.

Depending on the principles of early start and continuity, medical rehabilitation is divided into:

- Phase of early rehabilitation.
- Phase of patients rehabilitation.
- Phase of invalids rehabilitation.

Staging achieve in compliance with stage medical aid organization: hospital or therapeutic, polyclinic, sanatoria and health resorts.

Complexity principle realized in different methods of medical rehabilitation.

Methods of medical rehabilitation:

- Psychological R;
- Physical R;
- Therapeutic R;
- Reconstructive surgery;
- Clinical nutrition;
- Occupation therapy;
- Use of medical techniques.

According to the degree of invalidism, there are two varieties of R:

1. Course rehabilitation.

Short term rehabilitation carries out for limited, not permanent trauma. Course period is from several weeks up to 1,5 years to get maximum results in functional, home and professional sphere.

## 2. Continuous rehabilitation.

For chronic patients, it is long-term, sometimes permanent process of medical rehabilitation.

Individualism takes place when IPR (individual program of rehabilitation) will be accomplished. It is based on the specifics of organism functions disturbance in present disease, clinical course feature in present patient and his reaction on different forms of rehabilitation programs.

The accessibility principle may be real when all forms of rehabilitation are simple, economic and connected to other medical institutions.

Functional class (FC) and patient's rehabilitation potential are useful to define in medical rehabilitation complex.

Functional class is defined according to patient's life activities potential limitation.

### Criteria of life activity:

1. Movement.
2. Orientation.
3. Self-care.
4. Learning capability.
5. Communication.
6. Working potential.

Gitkina's criteria of life activities:

- FC0 - normal parametric indications.
- FC1 - minimal degree (0-25%).
- FC2 - medium degree (26-50%).
- FC3 - sub-maximum (51-75%).
- FC4 - maximum (>75%).

## **Rehabilitation Potential**

Before starting rehabilitation, it is better to know the RP, it is important because it plays the key role in making a prognosis and the correspondent plan of rehabilitation accordingly.

RP of patient of invalid – index that based on complex of medical, psychological and social factors, which estimate real potential of broken functions and organism abilities restoration. As well labor activity



participation.

To define RP, 3 groups of factors are needed to be estimate: medical, psychological and social.

**Medical factors are:**

- clinical course (character of disease, degree of manifestation of main and concomitant disease, frequency of exacerbation, treatment efficiency and course of medical supportive treatment necessity, possibility of disease involution);
- presence of functional reserves of organism, which can be used to develop compensatory mechanisms;
- clinic-work prognosis to define whether the patient can continue the same work or to define his capacity to carry out some other work.

**Psychological factors are:**

- Patients personals psychological specifics;
- Objective estimation of work activity continuation attitude or its correction.

**Social factors are:**

- patient home conditions;
- professional validity to continue the same job, or if he has other qualifications to do other jobs;
- possibility of requalification;
- existence of conditions for suitable job placement;
- patient's and his family's economical status.

In consideration of all this factors RP can be: high, middle, low.

High RP has patients with low degree of clinical symptoms:

- FC 0-1;
- adequate reaction to the disease and therapy;
- positive work attitude;
- favorable work prognosis.

Middle RP has patients and invalids with low and middle degree of clinical symptoms:

- presence of moderately concomitant pathology;
- FC 2;
- deadaptive type of relation to the disease and therapy;
- negative work attitude;
- favorable clinic-work prognosis.

Low RP has invalids with:

- Marked clinical syndromes;

- FC 3-4;
- deadaptive type of relation to the disease and therapy;
- dubious clinic-work prognosis.

### **Effectiveness evaluations of medical rehabilitation**

1. By clinical criteria:
  - visual evaluation (gait, behavior, state of skin and musculoskeletal system);
  - clinical indices (Ps, AP, joint movements, muscular contraction or rigidity presents);
  - functional systems indices;
  - instrumental and apparatus indices;
  - evaluation of adaptive capacity to perform work and home skills.
2. By scales, tests, questionnaires.
3. By economical criteria.
4. By social criteria:
  - indices of temporary disability;
  - indices of disability;
  - indices of working capacity potential.

### **General contraindications for medical rehabilitation:**

- resistant to drug correction hypertension;
- ischemic heart diseases with frequent rest angina pectoris attacks;
- myocardial infarction with heart insufficiency or angina pectoris attacks;
- active phase of rheumatism;
- circulatory insufficiency II – III degree;
- cardiopulmonary insufficiency II – III degree;
- active pulmonary tuberculosis;
- frequent epileptic seizures;
- marked psychic disorders;
- high body temperature, fever;
- acute inflammatory diseases;
- venereal diseases;
- malignant neoplasms;
- ununited fractures;
- unreduced joint dislocations;
- not healed (nonepithelized) burns;
- unstable osteosynthesis.

# PHYSICAL MEDICINE IN THERAPY AND REHABILITATION OF PATIENTS

The use of natural and precasted physical factors in therapy and rehabilitation has recently become more and more valuable.

Physicals factors have been found as suitable stimulating agents, they stimulate high brain centres, improve organism energy resources, accelerate metabolism, have positive effects on other systems - CNS, GIT, autonomic nervous system etc.

Physiotherapy (PT) is a medical specialisation which has become essential in therapy, rehabilitation and health improvement.

PT is a medical speciality, which research influence of natural or artificial physical factors on the human organism, and optimize their use in maintenance, restoration and consolidation of patients' health.

Today PT has rich sources of physical methods using a huge number of different apparatuses and techniques in almost all kinds of diseases. They used in:

- therapy;
- rehabilitation;
- prophylaxis;
- diagnosis.

## ***PT common contraction:***

- 1) malignant neoplasms;
- 2) systemic blood disorders;
- 3) marked cachexia;
- 4) circulatory decompensation;
- 5) haemorrhage or suspicion on it;
- 6) sever psychosis;
- 7) fever;
- 8) active tuberculosis;
- 9) individual intolerance of PT.

## ***Methods PT classification:***

1) Group - permanent electric current of low voltage (galvanization, drug electrophoresis).

2) Group - impulsive current of low voltage (electrosleep, diadynamic (currents) therapy, amplipulse therapy, interference therapy, fluctuorization, electrodiagnosis, electrostimulation).

3) Group - electrical current of high voltage (diathermia, ultrasonotherapy, local d'arsonvalization).

4) Group - electric, magnet and electromagnetic fields of different characteristics (franklinization, magnetic therapy, thermal induction, ultra high frequency therapy, microwave therapy).

5) Group - electromagnetic oscillation of optical diapason (infrared therapy, phototherapy, ultraviolet and laser therapy).

6) Group - mechanical oscillation of medium (massage, ultrasound therapy, drug phonophoresis, vibration therapy).

7) Group – modified or special air medium (inhalation therapy, or aerosol therapy, electro-aerosol therapy, barotherapy, aeroionotherapy, climate therapy).

8) Group - sweet water, natural mineral waters and their artificial analogues.

9) Group - heat (heat therapy) and cold (cryotherapy, hypothermia). In the capacity of thermal mediums used therapeutic muds (peloids, paraffin, ozokerite, naphthalanum, sand, clay, ice and others).

The reaction sequence which takes place in the organism as a result of physical factors action is divided in to 3 main phases:

- physical;
- physico-chemical;
- biological.

In the *physical phase*, the energy of the acting factor is transferred to the biological systems, tissues, cells, and environment.

The organism takes only part of this energy. Organism tissues have different selective properties for energy absorption. For example, energy UHF electric field is better absorbed by tissues with dielectric characters (bone, adipose) and micro-waves are absorbed by the tissues which contain much more water and electrolytes (muscles, blood and lymph).

Every physical factor has its character of mechanism and the level of energy absorption.

Energy absorption leads to physico-chemical shifts in cells and their environment. This leads to *physico-chemical phase* in the organism. As a result different physico-chemical forms able to metabolic reactions or physico-chemical shifts are generated.

Changes occur in cutaneous, subcutaneous tissue and muscles have local characters.

If they occur on the endocrine organs, then they determine the hormonal component of the therapeutic physical factors action.

The absorption of energy by the parts of the nervous system (receptors, nerve fibres, brain structures) and the following reactions which lead to physico-chemicals changes in these parts determine the reflex reactions of the organism.

It is important to know that one physical factor can lead to different physico-chemical effects, and different physiotherapeutic methods usage can leads to the same primary shifts. It's determining the universal mechanism of therapeutic physical factors action.

The third phase – is *biological phase*. It is the sum of direct and reflex changes in organs and tissues as a result of absorption of the physical energy by organism biological systems.

There are local, reflex-segmental and general organism reactions and their numerous components.

#### **Local changes in skin and tissues under the electrode:**

- hyperaemia, improvement of local circulation;
- metabolism stimulation (on cathode increase oxygen consumption, sudoriferous glands activities rise, kariokynetic process especially in epithelial tissues stimulate;
- intensification reparative processes;
- absorption actions;
- anti-inflammatory actions;
- increase in the skin biological active substances concentration (histamine, serotonin, bradykinin, acetylcholine);
- stimulation of skin receptors improves excitability and conductivity of peripheral nerve trunks.

**General effects** can be detected when general methods are used in specific reflexogenic areas. When impulses reach sub-cortical nodes and brain cortex. In this case the reaction character would be general:

- in the CNS and PNS;
- in endocrine system;
- in cardiovascular system;
- in GIT;
- in respiratory system (broncholytic action);
- in general metabolic processes;
- in immune mechanisms.

Electrical current which does not change its direction is called direct current. It can be: galvanic, impulse, exponential, half-sine pulse, right-angled pulse).

Alternating current – it is electrical current that periodically changes its direction and quantity.

### **Direct current**

#### ***Galvanization and drug electrophoresis***

Galvanization and drug electrophoresis represent 15-20% of all physical procedures.

Galvanization – therapeutic procedure that uses direct continuous current of low voltage (30-80 V) and also of low strength (up to 50 mA), connected to the patient via contact electrodes. Graphically it is a type of direct line.

#### *Method:*

Current is connected to the patient via two electrodes. Electrodes – this is electro conductive plate of milled lead (aluminium, noble metals) or carbonaceous cloth and rather greater gasket from hydrophilic material (gauze, flannel, thick flannelette) for protect skin under electrolysis products. If the surface is uneven galvanization conducts through the water (glass or porcelain basins can be used).

Electrode can be situated longitudinal, transversely and obliquely-transversal.

Classification according to pathological areas:

- local influence: when the pathological area is between the electrodes;
- general influence: galvanization of the whole body (four-chamber bath, by Vermel);
- segment-reflex influence: electrodes are located in the reflexogenic zones of the skin (which is specified to this pathology, e.g. tender Zahar'in-Head's zones, BAP).

A dose depends on current force and its duration.

#### *Indications:*

- injuries, infections, toxicities, PNS (radiculitis, neuritis, neuropathy, neuralgia, neuromyositis);
- diseases of CNS (blood vessels, infections, trauma) and their complications: migraine, brain transient ischemia and encephalitis complications);
- gastrointestinal diseases (gastritis, colitis, cholecystitis);

- CVS, cardiac ischemic diseases, hypertension;
- chronic inflammatory diseases including;
- obstetrics and gynaecological diseases;
- in surgery: chronic osteomyelitis, fractures;
- in ophthalmology: glaucoma, retina degeneration and infections;
- in stomatology: neural and infectious diseases.

### ***Drug electrophoresis:***

This is special electro-pharmacological method, which use permanent electrical current to introduce drugs to organism.

Theory of electrolyte dissociation (Svante-Arrhenius, 1887) can explain the method.

Main basis of theory:

- 1) all substances divide into electrolytes or nonelectrolytes, if a direct current let in electrolytes medium, it will dissociate to positive and negative ions;
- 2) ion move under the direct current: cations go cathode and anions to anode, ions - conductors of second type (tissue), electrons - conductors of the first type (metals);
- 3) dissociation is reversible process, i.e. in solutions or melts of electrolytes ions can dissociate and associate.

The drugs introduced to organism follow the route of current i.e. places of low resistance:

- ducts of skin glands;
- intracellular spaces;
- at 8-10% intra skin via membranes.

### ***Advantage of drug electrophoresis:***

1. Local high drug concentration can be achieved, i.e. there is no need to saturate the whole organism.
2. No side effects.
3. Supports the prolongation of drug action.
4. The ion form of drugs is more effective than the molecular one ( $\text{Mg}_2\text{SO}_4$ ).
5. Painless.
6. Has a complex and integral action.

### ***Impulse electrotherapy:***

In comparison with direct current impulse therapy has the advantage:

- Less probability of adaptation because the possibilities and action parameters and the diapason of changes are vast enough to be adapted.
- Can reach deep tissues.
- Used for the best realization specific component this indicates or illustrates its amplitude value.
- Tolerated better by pts., especially by patients with CVD.
- Impulse effects are different by their physical characteristics (impulse duration, pause, frequency and depth of modulations).
- A big advantage is its huge physical impulse therapeutic potential, this can be explained by the fact that all bio systems act in impulse regimen, i.e. the reaction to impulsive therapy is physiological.

DDC (Bernar's current) method – is a method of impulse therapy, by which patients get a low frequency half-sinusoidal form of impulse current, of 50-100 Hz, during the period of 0,01 sec. they can be mobilized and their frequency is changeable.

Mechanism is the same as for the galvanic current. And therapeutic effects from these currents are results of galvanic currents.

***Amplipulse therapy:***

Alternating current - SMC. Amplipulse therapy: a method of electrotherapy which uses alternating sinusoidal modality current (SMC) of low voltage and low frequency 10-150 Hz.

***Therapeutic effects:***

- Stimulation (cell depolarization and repolarisation).
- Pain relief.
- Spasmolytic.

***Electrosleep:***

A method of neurotropic therapy, the basic idea is to affect the CNS with permanent impulse current (right angle form) of low frequency (1-160 Hz) and low voltage (up to 10 mA). Impulse currents 0,2-0,5 mc (corresponding to the chronaxia of the brain) are used. Impulse current with such parameters stimulate physiological sleep when it acts by eye-occipital method. Mechanism based on the reflex and direct action of the current on the brain.

There are two phases of therapeutic effects of electrosleep:

Inhibition: sleepy situation; Ps decrease, respiration, AP and electro activities of braindecreasing.



Stimulation: or reactivated directly when the stimulating agent stops its action, i.e. patient is in a good mood, active and able to work.

*Indications:*

- neuroses;
- NCD;
- starting phase of cerebral vessels atherosclerosis;
- injuries of skull and brain complications;
- chorea;
- encephalitis complications;
- AP increase and decreasing of AP I- II;
- ischemic heart diseases I-II;
- bronchial asthma;
- diseases of GIT;
- eczema;
- hestosis of second half of pregnancy.

*Contraindications:*

- eye diseases;
- face skin diseases;
- hysterical conditions;
- epilepsy;
- presents of metal things in skull area;
- current intolerance;
- general contraindications to physiotherapy.

# ASSESSMENT OF MEDICAL REHABILITATION EFFECTIVENESS

## *FUNCTIONAL TESTS*

Functional research methods this is specific methods use to assess functional status of human organism.

Functional test: an exercise uses to assess the human tolerance and changes in function of different organs and systems following this exercise.

Criteria of physical exercises:

- Test must not be harmful.
- Test must be proper, i.e. to evoke the proper and constant changes in human body.
- Must be reliable and adequate to those in the daily life.
- Must be standard and easy to realize.
- Must be objective, i.e. the same result for the same group of people.
- Must be informative and test scores must concise the sportive results.

Indications for the functional tests:

1. To assess the readiness to physical exercise, therapeutic exercise or sport.
2. To assess the different organs, e.g. CNS, CVS, RS of healthy and ill individuals.
3. To assess the effectiveness of exercise programs for different purposes, e.g. rehabilitation and fitness.
4. To expertise professional validity.

Contra indications for the functional tests:

1. Grave common condition of patient.
2. In sever phase of disease.
3. High temperature.
4. Haemorrhage.
5. Circulatory dysfunction.
6. Not stable or rapid progression of angina pectoris.
7. Hypertensive crises.
8. Aneurism of blood vessels.
9. Aortic stenosis.
10. Acute heart rhythm disturbance (tachycardia more than 100-110 beats per minute; group, frequent or polytopic extrasystoles; ciliary

arrhythmia at alias).

11. Acute thrombophlebitis.
12. Acute respiratory insufficiency.
13. Bronchial asthma exacerbated by physical exercises.
14. Acute psycho-mental disorders.
15. If the test cannot be done when the patient has musculoskeletal or neuromuscular disorders.

Indications to stop test:

1. Progressive retrosternal pain; 2. Acute respiratory insufficiency;
3. Paleness of face and mycoses cyanosis, cold sweat; 4. Disturbance of movement coordination, limbs tremor; 5. Ataxia - not understandable speech; 6. Inadequate increasing AP to exercise or age; 7. Sharp Decreasing of systolic pressure; 8. Acute ECG changes;

**1. Functional tests to assess the nervous system:**

*Orthostatic test:*

The patient who did this test must lay horizontally 5 minutes, after that Ps in 15 sec. and AP should be registered, then he stand up quietly Ps and AP register again. Normally the difference between pulse frequency is 10-14 beats/min, and in AP not more than 10 mmHg in systole and diastole. Good sign consider when pulse pressure raised and not good sign when pulse frequency rise to 20 or more beats/min and obvious change in AP namely if the pulse pressure decreases.

*Klino-orthostatic test:*

The test carried out oppositely, i.e. Ps and AP registered firstly vertically, then horizontally. Good reaction considered when Ps not raises more than 4-6 beats/min and AP not more than limited norm. Abnormal scores, refer to irritation reaction of sympathetic or parasympathetic nervous system.

*Romberg test:*

Indicate if there is any incoordination in stand position. Test carry out in 4 positions with continuous reductions of bearing area (1 - in the standing position, closed heels, head raise, closed eyes, hands forwards, fingers separate; 2 - the same but foots are on straight line one behind another; 3 - the same but stand on one foot and the other flexed and supported with foot toes on the knee; 4 - stand on one foot, the other one flexed in knee joint, in "horizontal stand"). Good result considered if patient in 15 sec. keep his coordination (3<sup>rd</sup> and 4<sup>th</sup> positions for sportsmen) normally, in this positions. Tremor, movements of eyelids and

body must not to take place. If there is tremor – score acceptable. If incoordination takes place in 15 sec. - score unacceptable. Test well informative in the case of CNS and neuromuscular system assessment.

*Yarotskij test:*

Test assesses the vestibular system. Test starts in stand position with eyes closed, then the patient following instructions begin to rotate his head until he loses his coordination. 27 sec. is normal for healthy persons and 90 sec. and more for sportsmen.

*Finger - nose test:*

The tested subject tries to touch his nose with his index finger, first with his eyes opened, then with the closed ones. Normally, this trial is successfully accomplished, but in case of neurological disorders, head trauma, tiredness and other states this test provoked hand tremble or the nasal tip missing.

*Tapping Test:*

This test determines the maximal frequency of hand movements. The tested subject uses piece of paper and pencil, paper divides in to 4 squares. During 10 sec. he must put points in first square, then 10 sec. pause, and repeat this in the other 3 squares. Test duration 40 sec. Test assess by the numbers of points in each square. Trained sportsmen put more than 70 points in 10 sec. Stepwise decreasing in points numbers refer to unstable locomotive sphere, nervous system. A stepwise decreasing lability of neural processes indicates warming-up processes deceleration.

*Ashner oculomotorius reflex:*

HR registered in the lying position with closed eyes. Then continuously press on the eyeballs 10-15 sec. and register Ps frequency again. Normally Ps decreases 4-10 beats/min. Decreasing more than 10 beats/min indicates increasing excitability of parasympathetic nervous system, decreasing Ps only 2-4 beats/min or increasing – perverted reaction – indicate sympathetic dominancy.

## **2. Tests determine functional status of muscular system**

*Test assesses strength and tolerance of back muscles:*

Lying on a couch on abdomen takes a “swallow pose” (sag, hands by the sides of the body, legs straight and up). Norm in this position 2 - 2,5 min.

*Test assesses strength and tolerance of abdominal muscles:*

Lying on a couch on the back with straight legs 15-20cm up and hold this position, norm 2 - 2,5 min.

*Strength-acceleration indication assessment:*

1. Standing jump. 2. Jump on chair, push off floor by 2 legs (how much in 15 sec). 3. Push up using hands only (how much in 15 sec). 4. Lifting up legs under the right angle in hang on wall bars (how much in 15 sec). 5. Chin-up (how much in 10 sec). 6. Flexion of upper body part with fixed legs (partner), started position laying on the back (how much in 30 sec). 7. Sagging from started position lying on abdomen tries to extend with hands by the body sides, hands along the body (how much in 15 sec).

*Strength tolerance assists by:*

- 1) squatting (how much);
- 2) jump upwards from sitting position (how much);
- 3) chin-ups (how much);
- 4) push up using hands only (how much);
- 5) from lying position the back to sitting position (how much);
- 6) lifting up legs under the right angle in hang on wall bars (how much).

There is a linear dependence between the number of repetitions and muscle system strength.

**3. Tests to assess the functional status of respiratory system:**

*Shtange test:*

The tested man/woman in sitting position after 3-5 min. rest do deep inspiration and deep expiration then stop breathing after deep but not maximum inspiration with close mouth and hold one's nose. Stopwatch used; normal breath-holding is 40-50 sec., well trained sportsmen up to 5 min., children 6 years old: from 15 sec. (for girls) to 20 sec. (for boys); children 10 years old: from 20 sec. (for girls) to 35 sec. (for boys).

*Genshi test (or respiration stop in expiration phase):*

The same as in Shtange test but breath hold in expiration phase. Not trained people: 25-30 sec., sportsmen: 30-90 sec.

*Rosental test:*

This test assesses the functional capacity of respiratory muscles. Using spirometer 5 times with 10-15 sec. interval, fix Lungs Vital Capacity (LVC). Normally same readings fixed, when LVC gradually increase (good), when decrease (not satisfied).

*Serkin combined test:*

The first phase: determine time of breath-holding in inspiration phase in the sitting position; second phase: determine time of breath-holding in inspiration phase straight after 20 squatting in 30 sec.; third phase: after 1 min. repeat the first phase.

### Assessment of Serkin test

Examine contingent	Phases		
	1 <sup>st</sup> phase	2 <sup>nd</sup> phase	3 <sup>rd</sup> phase
Healthy, not trained	35-45 sec.	30-50% of 1 <sup>st</sup> phase	70-100% of 1 <sup>st</sup> phase
Healthy, trained	45-60 sec.	more than 50% of 1 <sup>st</sup> phase	more than 100% of 1 <sup>st</sup> phase
With latent circulatory insufficiency	20-35 sec.	less than 30% of 1 <sup>st</sup> phase	less than 70% of 1 <sup>st</sup> phase

#### *Skibinskaja index:*

Takes measure of lung vital capacity (LVC) (ml), breath-holding (T) (sec.) and Ps (per min). Assessment of cardio-respiratory system formula:

$$\frac{\text{LVC (ml)} / 100 \times \text{T (sec.)}}{\text{Ps (per min)}}$$

Index assessment: less than 5 – very bad, 5-10 – poor, 10-30 – satisfactory, 30-60 – good, more than 60 – excellent. Trained sportsmen have index more than 80.

#### **4. Tests for cardio-vascular systems assessments**

##### *Martine-Kushelevskij test:*

This test for mass prophylactic consult of students, pupils, sportsmen of mass classes, also in clinics of internal diseases, but the amount of squatting decrease in accordance to the ability of each patient.

The tested people sit to left side of the doctor. Tonometer cuff fix on the left shoulder. AP - registered 3 times and the minimal systolic and diastolic readings should be considered. Ps - registered in 10 sec. spaces of time, if two will be the same (Ps - 12, 12 in 10 sec.) indicate rhythmic pulse, if not i.e. (12, 13,) not rhythmic pulse. Then the tested man do 20 deep squatting in 30 sec. In every squatting he must put his hands in front of him. After exercise, he sits on chair. Ps count in first 10 sec. of first restoration minute with stopwatch, than AP in 40 second and again Ps - in last 10 sec. Repeat this in the 2<sup>nd</sup> and 3<sup>rd</sup> minute also. Register pulse character (rhythm, fullness), auscultation pattern (tones and murmurs). The example of these data in form of table.

Martine-Kushelevskij test (20 squatting in 30 sec.)			
Before exercise	AP	120/70 mmHg	
	Ps	12, 12 in 10 sec.	
After exercise	Restoration		
	1 <sup>st</sup> minute	2 <sup>nd</sup> minute	3 <sup>rd</sup> minute
Ps after 10 sec.	18	13	12
AP	145/65 mmHg	130/70 mmHg	120/65 mmHg
Ps after 50 sec.	14	12	12

In accordance to character of change types of Ps and AP after the exercise, 5 types CVS reactions noticed: 1) normotonic, 2) asthenic or hypotonic, 3) hypertonic, 4) dystonic, 5) stepwise reactions.

1) *Normotonic reaction.* Character of this reaction is increasing Ps frequency, increasing systolic pressure; diastolic pressure not change or decrease. Pulse pressure increase. When Martine-Kushelevskij test done, systolic AP rise at the average to 18 mm Hg, diastolic - not change or decrease to 5 mm Hg. Restoration period last 1 to 3 minutes. Outlook character of tiredness is slight face hyperaemia. This reaction considered physiological, because of maximum AP considered indirect character heart beats force, minimum AP - general peripheral vessels tone, pulse AP - volume beats, middle AP- general work of vessels contour, (middle AP = AP minimum + pulse AP/ 2).

In this case, maximum effectiveness of heart work obtained by combining incensement of heart frequency (heart rate) and pulse AP (for account of decreasing AP minimum and increasing AP maximum), and therefore in the case of relatively stable middle AP. Well known, the increment of heart rate proportional depend on physical exercise potential, increasing in beats volume has exponential dependency. And frequently the increment of heart rate dominates over the increment of AP, and increasing of minimum circulatory volume takes place at the expense of heart rate increasing.

2) *Hypotonic (asthenic) reaction.* Main properties are: considerable increasing of heart rate, moderate increasing of systolic pressure, not change or moderate increasing in diastolic pressure, pulse pressure not changed or even decreased. Exercise results in increasing of blood circulation depending mostly on increasing of heartbeats and not in beats volume, which is extremely not rational for heart. Period of restitution prolonged (heart rate up to 5-7 min., AP up to 2-4 min.). Signs of tiredness include pale skin colour, lips cyanosis, breathlessness and cold sweat. Found in patients with cardio-vascular diseases. Some authors (V.I.

Dubrovskij, 1999; G.M. Zagorodny and others, 2000) consider this type of reaction as hypotonic, but our experience indicate that in some cases when systolic and diastolic AP parallel decreasing after exercise without change in pulse pressure. Heart rate increases considerably and restitution time prolonged. Such reaction can be considered as a typical hypotonic reaction.

3) *Hypertonic reaction.* It Characterised by sharp and significant increasing of systolic pressure up to 180-190 mmHg synchronously with diastolic pressure increasing to 90 mm Hg or more and considerably increasing of Ps frequency. Restitution period prolonged up to 3-7 min., and outward signs of tiredness characterised by breathlessness, hyperhydrosis, and expressed face hyperaemia. G.M. Zagorodny and others, (2000) recognised hypertonic reaction types with increasing diastolic AP, without increasing diastolic AP and stepwise. These types of hypertonic reactions possible with stepwise exercises among qualified sportsmen.

4) *Dystonic reactions.* This type characterized by considerable increasing systolic pressure more than 180 mmHg simultaneously decreasing of diastolic pressure, sometimes it's not determine (the mistakes limit of Korotkov auscultatory method allows fixation of zero division mmHg). In this case speaks about «endless tone» phenomenon. Heart rate increasing sharp, restitution time prolonged up to 4-5 min. Main mechanism of this phenomenon is discrepancy of cardiac output and peripheral vessels tone.

During to stepwise increasing veloergometric test, moderated to “deny” an exercise, in healthy swimmers 12-14 years old (males and females) we detect an «endless tone» phenomenon appears in 75-80% and consider it as a normal variant. At this moment at the peak of physical exercise, heart rate reaches 200-210 beats/min. Combination of this phenomenon with nervous system and cardiac pathology, especially in adults (sportsmen), considered as unfavourable.

5) *Stepwise reaction type.* Systolic pressure increases stepwise after the 2<sup>nd</sup> and 3<sup>rd</sup> restitutions minutes, when systolic pressure more than that in 1<sup>st</sup> min. Restitutions period dragged on till 7 min. Such reaction reflects inadequate circulatory system regulatory action and assessed ass unfavourable.

Also Martine-Kushelevskij test assess by index quality of reaction (IQR) of cardiovascular system response to exercise. For this Kushelevskij and Zislin formula have used:



$$\text{IQR} = \frac{\text{Pa}_2 - \text{Pa}_1}{\text{P}_2 - \text{P}_1}$$

Where:  $\text{Pa}_1$  - pulse pressure before exercise,  $\text{Pa}_2$  - pulse pressure after exercise,  $\text{P}_1$  - pulse before exercise in 1<sup>st</sup> min.,  $\text{P}_2$  - pulse after exercise in 1<sup>st</sup> min., positive IQR = 0,5–1.

*Three steps test of speed and exercise tolerance (prof. S.P. Letunov):*

Test includes three exercise components, use for sportsmen high qualifications. The 1<sup>st</sup> is 20 squatting in 30 sec. - warm-up, 2<sup>nd</sup> run in place during 15 sec. with maximum intensity - exercise for speed, 3<sup>rd</sup> run in place duration 3 min., 180 steps /min. - exercise for tolerance. Ps and AP fixed before and in restitutions period by Martine-Kushelevskij test principle, consider the restitution time after 20 squatting is 3 min., after 15 sec. run - 4 min., after 3 min. run - 5 min. General test assessment will be given, after analysis CVS type of reaction each of exercise component.

## GENERAL FUNDAMENTALS OF KINESITHERAPY

Kinesitherapy (therapeutic physical training) – is one of the most ancient medical disciplines. It is almost impossible to specify the exact date when physical exercises and massage were first applied. The origin of kinesitherapy should be traced in the source of ancient folk medicine. Apparently, the application of certain exercises and massage methods is based on instinctive gestures of stroking and rubbing the sores, active and passive moving of affected extremity. The cases of applying physical exercises with therapeutic purpose had been described in 3 000 B.C. in ancient Chinese medicine, and named as medical gymnastics, based on respiratory exercises. There are some ancient documentary sources, proving application of this method many years ago, such as Egyptian hieroglyphs of sarcophagi and pyramids, the Chinese book “Kong-fu” (2698 B.C.), the Indian book “Ayurveda” (1800 B.C.). They mention the use of physical exercises and massage in treatment of diseases.

In ancient Greece medical gymnastics was the object of great attention and occupied a significant part in medicine of that time. The most eminent physician of ancient Greece Hippocrates (460-379 B.C.) was the first who described physiological and therapeutic effect of physical exercises. Galen, the follower of Hippocrates, used therapeutic exercises in cases of obesity, general asthenia and in other diseases. Abu-Ali Ibn-Sina (Avicenna) asserted that physical exercises are more important for health maintenance than feed and sleep regime.

During Renaissance period attention to application of physical exercises with therapeutic purpose increased. In 1573 Mercurialis issued the first textbook in medical gymnastics, where systematized data concerning therapeutic exercises have been introduced. He believed that “medical gymnastics should be learnt from a person who preaches medicine”.

In 1780 French physician C.J. Tissot issued the fundamental work “Medical and Surgical Gymnastics”, in which he assigned a significant part to physical exercises in treatment process. The following famous aphorism belongs to him: “Exercise can often replace different drugs, but no drug can replace exercise”.

In the 19-20<sup>th</sup> centuries the progress of medical science contributed to arising of various methods of therapeutic gymnastics in respiratory and cardiovascular diseases, locomotive apparatus pathology. The eminent surgeon N.I. Pirogov recommended using physical exercises for treatment

of the wounded.

The development of exercise therapy is closely related to the achievements obtained in the sphere of medicine. The most intensive work out of practical methods in exercise therapy took place in the war period. In 1941 (first year of the Great Patriotic War) methods of therapeutic gymnastics in cases of chest, abdomen wounds, CNS traumas have been worked out and published. During the post-war period the scientific grounds of using kinesitherapy methods in treatment and rehabilitation of surgical patients have been presented, and the development of exercise therapy as a science was stimulated by achievements of modern anaesthesiology, surgery, traumatology and orthopedics. Significant contribution to the development of exercise therapy was made by the following scientists: prof. V.V. Gorinevskiy, prof. V.V. Gorinevskaya, corresponding member of RAMS (Russian Academy of Medical Sciences), prof. V.N. Moshkov, prof. I.M. Sarkizov-Serazini, prof. Y.I. Danko, prof. V.K. Dobrovolskiy, prof. S.M. Ivanov, prof. S.V. Hruschev, prof. V.A. Siluyanova, prof. A.I. Zhuravleva, prof. V.A. Yepifanov, associate prof. M.I. Fonarev and others.

The history of kinesitherapy development in Belarus is not rich in dates and scientists. Establishment of medical exercises dispensaries in the capital, regional centres and big cities initiated methodical-organizing support to sports medicine and exercise therapy that allowed applying methods of kinesitherapy in treatment and rehabilitation of patients and disabled persons. In hospitals and polyclinics exercise therapy rooms were opened. At the medical institutions the teaching course of exercise therapy was introduced.

During last years kinesitherapy has been used widely in the system of medical rehabilitation for the purpose of function recovery, prevention of complications in hypokinesia, adaptation to physical activity, formation of compensations, immunity stimulation, and life quality improvement. Kinesitherapy is available for patients at the medioprophyllactic institutions and sanatorium-and-spa institutions of the republic. The incidence of using this method amounts to 70%.

The scientific research into the problem of applying kinesitherapy in treatment of patients and disabled persons, have been activated at the present time.

**Kinesitherapy (KT)** is a medioprophyllactic method, based on using means of physical training to make rehabilitation process fast and effective and to prevent complications.

Movement is the ground of KT, and the most important biological function of a living organism. The method is physiological for an individual, it mobilizes his activity, and physical exercises have a broad spectrum of action.

KT is a method of non-specific therapy. Physical exercises involve into response all links of the nervous system, from the peripheral receptor to brain cortex. Besides, during muscular performance the products of muscle activity are formed, and getting into blood they has a stimulating effect on all systems of organism.

In most cases KT should be considered as a method of pathogenetic therapy, since the general reaction of organism involves physiological mechanisms, participating in pathogenetic process.

KT is a method of active functional therapy. Systematic dosed application of physical exercises in treatment process contributes to functional recovery of certain systems or develops functional adaptation of a patient.

KT is a method of non-medicinal supportive therapy, which is extremely important in the period of convalescence and remission. It can be considered as a method of prophylactic therapy, because physical exercises increase the resistance of organism to unfavourable factors.

The basic means of KT include physical exercises, natural factors of environment and massage. Physical exercises, as the main mean of KT, should be classified according to the method of their application, the character of muscle contraction, the principle of exercise intensity, the anatomical principle.

### ***Classification of the means of kinesitherapy.***

#### ***1. Gymnastic exercises:***

- a) isotonic (dynamic) - with muscle contraction the movement in a joint occurs - isotonic lengthening and shortening;
- b) isometric (static) - when a muscle works isometrically it shortens its muscular length and slightly lengthens its non-contractile components, and as the result no movement occurs in any of the joints;
- c) active and passive;
- d) specific - have selective effect on certain muscles and internal organs physiologically connected with them;
- e) developmental;
- f) reflexive - based on unconditioned motor reactions;
- g) corrective;
- h) exercises for muscle relaxation, stretching, coordination, strength,

balance;

i) respiratory exercises:

- static (pectoral, diaphragmatic and complete type) - performed only at the expense of the main respiratory musculature being contracted;
  - dynamic (symmetric and asymmetric) - performed with participation of the auxiliary respiratory musculature;
  - drainage exercises - for improving of sputum discharge;
- respiratory exercises - to prevent formation of adhesions in the pleural cavity and exercises to reduce bronchial spasms.

2. *Sports:*

a) walking; b) running; c) climbing and crawling; d) swimming; e) skiing; f) cycling and others.

3. *Games: passive, of little activity, active, sports.*

When doing physical exercises, the following principles should be followed:

1. Individual approach to the choice of means, methods and dosage considering a disease, age, sex, functional potential.

2. The means of KT should be applied systematically and consecutively.

3. Regular (not episodic) training.

4. Long-term application of KT means for function rehabilitating, adaptation and forming compensation.

5. Gradual increase of physical activity.

Among the basic types of KT the most often used are the following:

1. Morning hygienic gymnastics, helping the organism to move from the sleep state into the wakeful state.

2. Therapeutic gymnastics, which is the basic form of KT, consists of 3 parts: introductory, main, final. Therapeutic gymnastics must include exercises of a general and specific character and must be indicated in accordance with motion activity regime of a patient.

3. Graduated walking therapy.

4. Health path (path for walking exercise with signs marking distance).

5. Swimming therapy.

6. Hydrokinesitherapy (water physical exercises).

7. Exercises with training equipment.

***Natural factors of environment*** (sun, air, water). They are used in combination with other means of KT in order to improve health and increase general non-specific resistance of the organism. Natural factors

considerably enhance the effectiveness of physical exercises.

The effect of therapeutic gymnastics mainly depends on adequately chosen physical intensity, dosage, which is determined by choosing the initial position, character and complexity of exercises, pace of fulfilment, number of repetitions, and presence of emotional component.

Therapeutic gymnastics is conducted by the instructor of physical rehabilitation. His working schedule is made according to the patients' profile. KT is indicated by a physician in charge, or selected rehabilitation commission. The physician of exercise therapy assigns the methods, means, dosage of physical intensity, and then monitors procedure application and its effectiveness.

There are individual, group and consultative methods of conducting exercise therapy with patients.

**Individual method**, as a rule, is applied in patients with severe motor disorders (paresis, paralyse, contractures), when elements of passive application of physical exercises for patients staying in bed are necessary.

The most economical method is a **group method**, which is used in patients with the same illness and functional disorders, of the same age. At the hospital of infectious diseases exercise therapy with contagious patients is conducted in boxes. To follow the principle of single-step placement of patients into rooms (boxes), exercises can be held in groups (small groups). In the case if a department is properly equipped, isolated, with open terrace and solarium, therapeutic gymnastics can be held there by group method, in accordance with sanitary-epidemiologic regimen and the character of the disease in a certain patient.

**Consultative method** is more appropriate at the polyclinic stage of rehabilitation. It includes the training of a patient (disabled) or his relatives on a complex of physical exercises for unassisted exercising at home. The physician of exercise therapy occasionally controls conducting of exercises and their effectiveness. The efficiency of therapeutic rehabilitation in hospital depends a lot on a motor activity regimen of a patient. Several types of the motor regimen can be distinguished:

*1. Strict bed rest.*

The purpose is to ensure absolute physical and mental rest of a patient. Strict bed regimen is conditionally divided into passive bed rest (1 A), when a patient is not allowed to do active movements and therapeutic gymnastics is contraindicated, and active bed rest (1 B), when a patient is allowed to move in the lying position, turn from one side to another, and therapeutic gymnastics at the regimen 1 B of motor activity.

## *2. Extended bed rest.*

The purpose of this method consists in gradual adaptation to physical activity, stimulation of respiratory functions, blood circulation, digestion, prevention of complications. Placing a patient in the sitting position and developing skills of self-service are carried out.

## *3. Ambulation.*

The purpose of this regimen consists in adaptation to standing up, walking, recovery of organism functional state.

## *4. Unrestricted bed rest.*

The purpose of this regimen is to prepare a patient for domestic and professional physical activity, enhance psycho-emotional tonus, and stimulate general non-specific resistance of the patient's organism - preparation for discharge.

After discharging a patient from the hospital, therapy and rehabilitation can be continued either in polyclinic or sanatorium, where 3 types of motor activity regimen can be distinguished: limited activity, limited training and training.

Absolute contraindications to KT are important to be aware of:

1. Critical status of a patient, requiring resuscitation measures and intensive care conducting.
2. Acute phase of illness.
3. Febrile temperature (above 38° C).
4. Decompensation or increasing insufficiency of any system of the organism.
5. Haemorrhage.
6. Thrombosis.
7. Strong spontaneous pains.
8. Suppurative diseases before lancing (carbuncle, furuncle, phlegmon, abscess).
9. There is no contact with patients due to mental impairments and unconscious state.

As a rule, the mentioned contraindications have a temporary character. KT is indicated when positive dynamics of illness is observed.

## GENERAL BASICS OF THERAPEUTIC MASSAGE

Massage (French word, means “to rub”) is a complex of science-based methods of mechanical dosed actions which a massage therapist performs on the surface of human body with his hands, or with the help of apparatus or water current.

The mechanism of massaging action is similar to physical exercises, so massage can be called a passive gymnastics.

### **Massage Classification:**

The following types of massage can be distinguished:

*I - According to the purpose:*

1. Therapeutic massage (used in treatment of most diseases).
2. Hygienic massage (used for health strengthening, improvement of the functional state of organism, prevention of complications).
3. Sports massage:
  - a - preliminary (used by sportsmen as a preparation for trainings or competitions);
  - b - compensative (used after trainings or competitions);
  - c - training (used in addition to trainings).
4. Cosmetic massage (face massage).
  - a - hygienic (for hygienic purposes and prophylaxis of skin aging);
  - b - therapeutic (used in treatment of diseases of maxillofacial region).
5. Gynaecological massage - therapeutic bimanual massage (used in gynaecology).

*II- According to methods:*

- classical (based on effecting tissue in a layerwise way, with the use of four basic classic methods);
- reflexosegmental (based on affecting reflexogenic zones, and zones of hyper sensitization);
- nerve-point massage (effects biologically active points).

*Other types:* periosteal, connective-tissue, intestinal, oriental, Swedish, Finnish. These types of massage are used rarely in Belarus.

*III - according to technique:*

1. Manual.
2. Instrumental (brush, cupping glass, massager).
3. Apparatus.
4. Hydromassage.

Massage mechanism is based on complex interdependent reflectory, neurohumoral and local processes, caused by dosed mechanical effect.



Mechanical stimulations, caused by special massage methods, excite mechanoreceptors which are intended for transforming energy of mechanical stimulation into a neural one (initial link in the chain of neuro-reflexive reactions). Receptor stimulation in the form of centripetal (afferent) impulses is carried through sensory pathways to CNS (spinal cord, cerebellum, functional formations of the brain stem and cerebral cortex), where it transforms into a general complex reaction and causes different functional changes in organism.

With massaging actions the heat is formed in tissues, so massage stimulates thermal receptor system. Aroused stimulation is transmitted into the regulating vasomotor centre, located in the medulla oblongata, and then moving to sympathetic and parasympathetic nerves causes reflectory changes in vessel lumen.

Massage enhances the synthesis of histamine and acetylcholine in skin, which dilate arterioles, mobilize body defences, stimulate muscular activity, accelerate transmission of stimuli from neuron to neuron and to myocyte (neurohumoral massage action).

Besides its neuroreflexive and neurohumoral action, massage has a mechanical effect on muscular capillaries, which may contract at the expense of Rouget cells located in their walls. However, capillary lumen is also affected by chemical stimulants: hormones (adrenaline, noradrenalin), lactic acid, ATP.

In different illnesses massage helps organism to get rid off catabolic products, normalizes gaseous, mineral and protein metabolism, also stimulates protective-adaptive mechanisms and factors of specific and non-specific immunity (N.A. Belaya, 1983).

It is believed that the most physiological massage is massage performed by a qualified specialist. Duration and intensity of the procedure depend on a character and phase of pathological process, clinical presentation, and localization of massaging area, age and complications. Accordingly, massage has indications and contraindications.

General indications for massage therapy in acute illnesses: satisfactory patient's condition, termination of illness acute phase, periods of early and late convalescence, absence of complications and relapse signs, consent of a patient for a procedure.

General indications for massage therapy in chronic illnesses: end of acute phase, satisfactory patient's status, absence of febrile temperature and decompensation signs of the main and concomitant disease.

In every particular case, indications are determined by the character of the clinical course, the predominant involvement of one or another system, organ, area and etc. According to this, in cases of cardiovascular system involvement indications for massage therapy are the following (N.A. Belaya, 1987): ischemic heart disease, myocardial infarction, cardio sclerosis, hypertension, arterial hypotension, myocardial dystrophy, valvular defects, venous and arterial diseases.

Massage indications in respiratory system diseases: chronic non-specific lungs diseases, chronic pneumonia, bronchitis, emphysema, pneumosclerosis, and bronchial asthma.

Massage therapy in gastrointestinal tract pathology along with chronic diseases of that system in remission can be indicated, if there are syndromes stating the involvement of certain digestive organs: esophagitis, gastritis, duodenitis, enteritis, colitis and their combination (gastroenterocolitis), cholecystitis, cholangitis, hepatitis, pancreatitis, stomach and duodenum ulcerous disease, Crohn's disease, nonspecific ulcerative colitis, allergic and autoimmune diseases, and other pathological conditions. The mentioned syndromes often develop in alimentary toxic infections, acute and chronic enteric infections, acute and chronic viral hepatitis, cholangitis, amebiasis, and other diseases.

Disorders of CNS, mainly of traumatic origin, can be often found in general hospitals. Massage therapy is indicated in traumas, consequences of stroke, cerebral atherosclerosis, infantile cerebral paralysis, neurologic manifestations of osteochondrosis, consequences of poliomyelitis and others.

Indications for massage therapy in locomotor apparatus disorders: soft tissue bruises, sprain of ligaments and tendons, fractures and their consequences. Massage is used in cases of Bechterew's disease, osteoarthritis deformans, scoliosis, platypodia.

General Contraindications: acute phase of disease, febrile temperature, hypotonic (collaptoid) state, dizziness, strong asthenia, haemorrhages, thrombosis, severe heart rhythm disturbance, circulatory deficiency of III degree, blood diseases, suppurative processes of any localization, strong physical and mental fatigue, benign and malignant tumours, poor general condition, Quincke's edema and other acute manifestations of allergy.

Contraindications to massage in cardiovascular diseases: acute myocardial ischemia of a sudden character, hypertonic or hypotonic crisis, arterial thrombosis of the lower limbs in decompensation phase, aneurism

of vessels, aorta, heart, acute inflammation, thrombosis, acute varix dilatation with trophic disorders, vessels and lymph nodes inflammation, pulmonary-cardiac insufficiency of III degree.

Contraindications to massage in respiratory system abnormalities: acute febrile conditions, sever phase of exudative pleuritis, multiple bronchoectasis in acute phase (with disintegration), pulmonary-cardiac insufficiency of III degree, and active form of tuberculosis, neoplasms, acute trauma and burn of respiratory organs.

In inflectional diseases contraindications include haemoptysis, acute bronchospasm, croup of II-III degree, uncontrollable cough with sputum excretion, artificial pulmonary ventilation, inflammatory processes on the chest's skin (pyoderma, bedsores) and others.

Contraindications to massage in gastrointestinal diseases: abdominal palpatory tenderness, nausea, vomiting and signs of inflammatory process exacerbation; tendency to haemorrhages: peritoneum and intestine tuberculosis, swelling of abdominal cavity organs.

Therapeutic massage is not used in the following cases: acute (subacute) hepatic and renal insufficiency, toxic hepatic encephalopathy, DIC syndrome, strong diarrheal (colitis) syndrome, ascites and skin disease of abdominal and contiguous areas.

Contraindications to massage in diseases of central and peripheral nervous system: acute pains of different localization, including causalgia, acute radiculoneuritis, acute radicular syndrome based on osteochondrosis or another genesis, encephalitis, myelitis with trophic disorders in acute phase, swellings of different localization, diencephalic crisis, vasomotor abnormalities related to endocrine system disturbance, neurosis with affective burst, impulsive obsession, attacks, also sexual neurosis, impotency based on irritable weakness, strong physical or mental fatigue. Massage is not applied in the cases of symptoms of intoxication (temperature), exacerbation of the process (meningeal, focal, pathologic signs occur), impossibility to make a diagnosis, complications related to the main disease, and others.

The presence of the rash of any origin, haemorrhagic eczemas, bruises, staphylococcal and streptococcal dermatitis, bedsores, wounds, aseptic dressings are contraindications to massage therapy in various diseases. Massage is not applied in the cases of tuberculosis, skin tumours, eczemas, fungus disease of the nails and pilar parts of the body and some other diseases.

***The types of therapeutic massage.*** As it was mentioned before,

classical, reflexosegmental and nerve-point massages are mainly used in clinical practice.

### **Classic Massage**

The basic methods of classic massage are effleurage, rubbing, petrissage, and vibration.

**Effleurage.** According to this method, the massaging hand slides along the skin surface, pressing it without making folds. Several types of effleurage can be distinguished, such as area-based (superficial and deep), covering (continuous, discontinuous), tongs-, rake-, comb-like effleurage, and crosslike effleurage technique. These methods precede massage, and also can be performed in the period between other basic methods, or finish the procedure. In the result effleurage accelerates lymph and blood stream, improves sweat glands activity, and causes hemostimulation (V.N. Moshkov, 1954). Action of this method is directed towards surface layers of skin (epidermis, dermis).

**Rubbing.** It is the movement of the hand along body surface with deep pressing that moves skin and forms skin folds in front of the massaging hand. Rubbing is performed with fingers, by ulnar side or base part of the palm in a straight or helical manner. Besides, auxiliary methods are used: tongs- and comb-like rubbing, sawing, hatching, and slicing. Rubbing method precedes petrissage and acts on all skin layers, including subcutaneous fat and fasciae.

**Petrissage.** It is intended for acting on muscles. The principle of this method is that the muscle is seized with hands, slightly raised, pulled off, then squeezed and kind of pushed to release. Two types of petrissage can be distinguished: longitudinal and cross petrissage. The auxiliary methods include fulling, rolling, moving, grasping, pressing, pulling.

**Vibration.** It is the most deeply acting method, which has a strong reflexive effect. There are two types of vibration: continuous and discontinuous. Continuous vibration consists in messaging series of continuous vibrational movements to the body. In the course of continuous vibration, masseur's hands while pressing tissues do not lose contact with the massaging area, and create vibrational movements with the frequency 100-300/min. Auxiliary methods of continuous vibration: stable and instable vibration, shaking, joggling, and slight pushing. Methods of discontinuous vibration: puncturing, tapotement, slight slapping, cutting, whipping. They provoke vasodilatation, hyperaemia, decrease of nerve endings sensitivity, increase of oxygen and nutrients inflow and some other positive effects.

The general requirement for massage therapy is to reach average physiological condition by finding optimal position of the body or certain area, in which muscles are relaxed, as much as possible.

It is important to remember that different skin areas have different degree of tactile sensitivity. The minimal sensitivity to pressure is found in the back area along the middle line of the spinal column, conditionally taken as 1. The sensitivity of the middle line of the abdomen - 1,06, the middle line of the chest - 1,39, flexor surface of shoulders - 3,01, back surface of foot - 3,38, wrist joint - 3,80, forehead - 7,54 (L.A. Kunichev, 1979).

### **Reflexosegmental massage**

In 1889 Russian clinician G.A. Zaharyin presented the description of hypersensitivity zones (hyperesthesia), which appear upon skin reflecting the presence of internal organs diseases. In 1898 Head gave the more detailed description of these zones. Zaharyin- Head's zones, as they were named, are often used in massage therapy. Their existence is closely connected with segmental innervation of internal organs.

Functional interconnections between internal organs and segments of spinal innervation can be the reason for administration of reflexosegmental massage. The present type of massage is based on using features of segmental structure of the body: receptor stimulation of certain zones (Zaharyin- Head) affects corresponding organs and systems, innervated by the same segments of the spinal cord.

Collar and lumbar massages, offered by A.E. Scherbak and his colleagues, are the most often used techniques of reflexosegmental massage. Collar massage is used in treatment of arterial hypertension, migraine, sleep disorders, trophic disorders of the upper limbs. Lumbar massage is used in treatment of vascular diseases of the lower limbs, also for stimulation of sex glands function.

### **Segmental innervations of inner organs**

<i>Organ</i>	<i>Spinal segments</i>	
<i>1</i>	<i>2</i>	<i>3</i>
Heart, ascending aorta	C <sub>3</sub> - C <sub>4</sub>	D <sub>1</sub> - D <sub>8</sub>
Lungs and bronchi	C <sub>3</sub> - C <sub>4</sub>	D <sub>3</sub> - D <sub>9</sub>
Stomach	C <sub>3</sub> - C <sub>4</sub>	D <sub>6</sub> - D <sub>9</sub>
Intestine	C <sub>3</sub> - C <sub>4</sub>	D <sub>9</sub> - L <sub>1</sub>
Rectum	D <sub>11</sub> - D <sub>12</sub>	L <sub>1</sub> - L <sub>2</sub>
Liver, gall-bladder	C <sub>3</sub> - C <sub>4</sub>	D <sub>6</sub> - D <sub>10</sub>
Pancreas	C <sub>3</sub> - C <sub>4</sub>	D <sub>7</sub> - D <sub>9</sub>

<i>1</i>	<i>2</i>	<i>3</i>
Spleen	C <sub>3</sub> - C <sub>4</sub>	D <sub>8</sub> - D <sub>10</sub>
Kidneys, ureter	C <sub>1</sub>	D <sub>10</sub> - D <sub>12</sub>
Urinary bladder	D <sub>11</sub>	L <sub>3</sub> , S <sub>2-4</sub>
Prostate	D <sub>10</sub> - D <sub>12</sub>	L <sub>3</sub> , S <sub>3</sub>
Uterus	D <sub>10</sub>	L <sub>3</sub>
Ovaries	D <sub>12</sub>	L <sub>3</sub>

All methods of classic massage and its variants are used in reflexosegmental massage therapy, with consideration of phase, activity, localization of pathological process and patient's condition.

### **Nerve-point massage**

This type of massage is a variety of chzen-dzu therapy (traditional medicine of China). Nerve-point massage affects biologically active points (BAP) by using methods of pressing, rubbing and stable continuous vibration unless the feeling of swelling, heaviness, numbness, aches and pricking occurs.

The types of nerve-point massage:

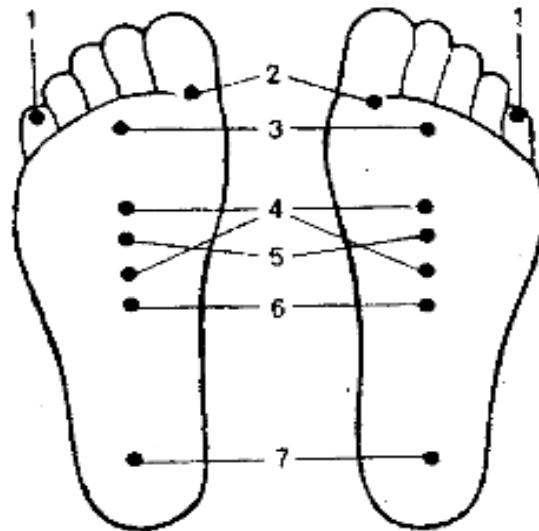
1. Strong (inhibitory variant) - analgetic and relaxing action (duration of the action on BAP - 5 min.).
2. Mild (inhibitory variant) - relaxing action (duration of acting on BAP - 2-3 min.).
3. Weak (excitatory variant) - stimulatory and tonic action (duration of acting on BAP - 1-1,5 min.).

Massage points can be corporeal and auricular.

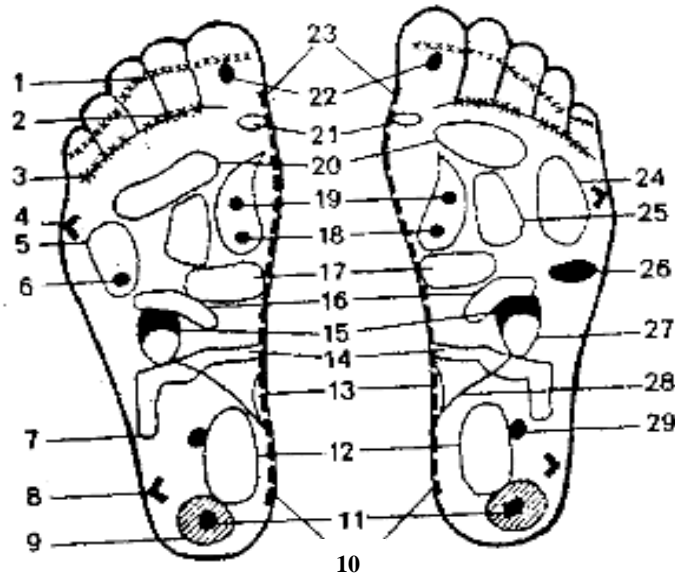
Biologically active points of feet are shown in Figure 1. Massage of these points can reduce pain and have therapeutic action on certain organs.

Massage therapy must be performed by a qualified specialist only. Before starting the procedure, he should do a number of exercises to prepare his hands (A.F. Ahabadze, V.Y. Arutiunov, 1986):

1. Stand on toes, extend arms at shoulder level, raise them (inspiration), stand on feet, arms down (expiration).
2. Bend arms in elbow joints, hands to shoulders, circular movements of shoulders joints.
3. Raising arms clench fingers at the same time and then unclench.
4. Relax hands, raising arms up, down, then extend, and shake them.
5. Lock palms in front of the chest, strongly pressing fingertips move hands to the right and left side.



Right foot



**Figure 1: Zones of action in pedotherapy:**

*Upper picture* (according to Konig, Wancura): 1 - headache, vertigo, prolonged childbirth; 2 - orchitis; 3 - epilepsy, fingers pain; 4 - hypertension, tachycardia, pain and convulsions in legs; 5 - Ion-guan point; 6 - headache, menorrhagia, convulsions of calves. 7 - insomnia, pain in the sole.

*Lower picture* (according to Bergson, Tiejak): 1 - brain reflexes; 2 - eye; 3 - external ear; 4 - shoulder; 5 - liver; 6 - gall-bladder; 7 - appendix; 8 - thigh and knee; 9 - skeletal system; 10 - sacral bone; 11 - sciatic nerve; 12 - small intestine; 13 - urinary bladder; 14 - bowels; 15 - adrenal gland; 16 - pancreas; 17 - stomach; 18 - parathyroid gland; 19 - thyroid gland; 20 - lungs; 21 - trachea; 22 - hypophysis; 23 - cervical spine; 24 - heart; 25 - thymus gland; 26 - spleen; 27 - kidney; 28 - ureter; 29 - genital zone.

6. Lock hands strongly, pressing fingertips, move hands to the sides without moving fingers.

7. Extend arms forward, perform circular movements.

8. Hands in front of the chest, bend and unbend fingers in interphalangeal and metacarpophalangeal joints.

9. Lock fingers closely and move palms to the sides in radio-carpal joint.

10. Clench fingers and move them in radio-carpal joints in a circular manner.

Massage is the mean of prophylaxis, therapy, rehabilitation of affected organism functions, normalization of working ability (in physical and mental fatigue) and physical improvement.

The knowledge of basis of general, reflexosegmental, nerve-point massage, adequate administration, combination with other methods of rehabilitation therapy, proper conducting of massage procedure (according to methodology) increase considerably effectiveness of therapy and rehabilitation, allow to decrease percentage of disability cases in different pathologic conditions.



## PHOTOTHERAPY

**Phototherapy** - is therapeutic usage of electromagnetic oscillation of optic diapason, including infra-red, seen and ultra-violet rays.

*Infra-red rays* - The spectre of electromagnetic oscillation with wavelength from about 800 nm to 1 mm. In phototherapy the waves used to be from 760 nm – to 2  $\mu$ m, which obtained from artificial sources of light. These rays absorbed to the depth of 1 cm. The longest infra-red reaches to 2-3 cm deeper.

The infra-red radiation has relatively low kinetic energy, so, when this energy absorbed causes the increasing of oscillatory and rotational movements of atoms and molecules:

- Brownian motion.
- Electrolytic dissociation.
- Ions movements.
- Accelerate electrons speed in their orbits.

The result is temperature generation.

All warm objects are sources of infra-red rays, human body is not exclusion; on the contrary it's a potential source of these radiation and also good absorptive of it. Temperature generation leads to rise of temperature of illuminated cutaneous covering on 1-2°C and provoke local vessels reactions.

The heat energy considerably accelerates tissues metabolic processes. Activation of microcirculatory bed and vascular permeability increasing enable to evacuate the cell autolysis products. Some fluid evaporates with sweat enhancing the dehydration of inflammatory focuses. Therefore, this infra-red radiation use effectively in the last phase of inflammatory process.

*Therapeutics effects:*

- anti-inflammatory;
- metabolic;
- local analgesic;
- vasoactive.

*Indications:*

- bad healing ulcers and wounds;
- chronic and subacute nonsuppurative inflammatory diseases of internal organs;
- burns and frostbites;
- diseases of peripheral nervous system with the pain syndrome (neuralgia, myositis);

- complications of musculoskeletal system injuries.

*Contra-indications:*

- acute purulent inflammatory diseases;
- brain circulation insufficiency;
- vegetative dysfunction;
- sympathalgia;
- propensity to haemorrhage;
- active tuberculosis.

*Apparatus:*

Artificial sources of infra-red radiation:

- medical reflector (Minin's lamp) - incandescent lamp with envelope of blue cobalt glass (25-60 W).
- Lamp Solux:
  - a) mobile PLC-6M (500-1000W) ;
  - b) table lamps OSN-70 (150-200W), LSN-1M (150-200W).

Methods: reflector put in to 30-100 cm from illuminated surface, till the feeling of pleasant warm. Duration 15-30 min, 1-2 times/day; 20-25 procedures/course.

**Chromotherapy**

Chromotherapy is the therapeutic usage of seen rays (400-760 nm).

Seen rays have a signal or stimulated character and via sight organ they determine the human daily biorhythm.

Colours selectively effect the excitability of higher cortical and subcortical nervous centres, therefore they modulate the human psycho-emotional status:

- red and orange rays - stimulate cortical and subcortical centres;
- blue and violet - inhibit those centres;
- green and yellow - balance stimulation and inhibition processes in brain cortex;
- white light - balance the human vital activity and his efficiency.

Now known, the sky blue and blue radiation photobiologically destructs hematoporphyrin, and, as the blue spectrum not penetrates deep, it is used to cure the jaundice of the newborn. So, as a result of action of these rays, bilirubin catabolic products will be formed, they are water soluble and they have excreted with urine and bile.

*Therapeutic effects:*

- psycho-emotional;
- metabolic;
- photo destructive;

*Indications:*

- tiredness;
- neuroses;
- sleep disturbance;
- trophic ulcers;
- bad healing wounds;
- jaundice of the newborn.

*Apparatus:*

Minin's lamp, Solux - with light filters.

VOD-11, KLA-21- use for treatment of jaundice of the newborn.

Light bath – seen and infra-red radiation.

**Ultra-violet radiation**

UVR-used when patient needed to be radiated with ultra-violet lights  
UVL.

Radiation with UVL stimulates photo-chemical and photo-biological reactions in the skin:

- destruction of protein molecules (photolysis);
- synthesis of more complex biological molecules (photo-biosynthesis) or synthesis of molecules with more complicated photo biophysical, chemical characters (photo isomerisation).

According to wavelength, become the compensation and degree of reactions expression of UVR.

A: 400-320 nm (LUV); B: 320-280 nm (MUV); C: 280-180 nm (SUV).

The most penetration power has long-wave ultra-violet (LUV) radiations (1mm).

One of the leading components of physiological and therapeutic action of UVR is effects linked to photochemical erythema generation.

UV-erythema takes place after 4-12 hours of radiation, this place of aseptic inflammation attended by vasodilatation and overflow of capillaries, fibrinoid swelling and change of vascular permeability, oedema and tenderness. After 3-4 days erythema disappears.

*Therapeutic effects:*

- anti-inflammatory;
- desensitizing;
- anaesthetic;
- trophic (metabolism time);
- bactericidal;
- immunostimulating (UVR of blood);
- Support function of CVS, RS and CNS.

*Devices:*

1. Integral - radiate all spectrum of UVR.

2. Selective - radiate LUV or SUV.

a) Arc mercury quartz tubular torch – AMT; for group, individual, general and local irradiation.

b) Arc bactericidal lamp – AB; for local irradiation or irradiation of mucous membranes.

*Methods:*

1. General. 2. Local. 3. UVR of blood.

**Laser therapy**

Laser therapy – this is the usage of low energy laser radiation for treatment.

Laser radiation – this is electro-magnetic radiation of optical diapason, which has no analogues in nature.

LR is monochromatic, polarized, good focus on.

The word “laser” comes from combination of the first letters of phrase (Light amplification by stimulated emission of radiation».

LR is nonspecific biostimulant of metabolic and reparative processes:

- accelerate wounds healings;
- bacteriostatic effect;
- improve regeneration;
- anti-inflammatory effect;
- improve blood circulation;
- reduce tissues oedema;
- immunity stimulation.

*Apparatus:*

Generally three types of therapeutic laser equipment manufactured:

1. Based on helium-neon lasers, work in continuous mode radiation generation with wavelength of 0,63  $\mu\text{m}$  and output power 1-200 mW (devices ULF-01 «Yagoda», AFL-1, AFL-2, «SHATL-1», «Platan-M1», «Raskos» at alias).

2. Based on semiconducting lasers, work in continuous mode radiation generation with wavelength of 0,67-1,3  $\mu\text{m}$  and output power 1-50 mW (ALTP-1, ALTP-2, «Izel» etc).

3. Based on semiconducting lasers, work in pulse mode radiation generation with wavelength of 0,8-0,9  $\mu\text{m}$ , pulse power 2-15 W and pulse duration 10-100 sec. («Uzor», «Uzor-2K», «Lazurit-3M», «Nega», «Azor-2K» etc).

Also there are devices for magneto-laser therapy («Mlada», «Lazur»,

«Erga»), and magneto-infrared laser therapeutic apparatus «Milta».

#### *Methods:*

Laser therapy treatment carried out in a manner suitable for patient, in standing or lying position.

The body part expose to irradiation should be bare. Patients' eyes must be protected with special glasses. During the procedure patient may feel faint warm in the place of exposure.

During laser therapy irradiates directly lesion focus, skin projection of affected organ, reflexogenic zones or acupuncture points (laser acupuncture). Procedures carry out of defocused or focused laser ray. If irradiation area is large it divides in to several fields with area no more than 80 cm<sup>2</sup>.

#### **Ultrasound**

Ultrasonic therapy - this is the use of mechanical vibrations ultrahigh frequencies in prophylaxis and therapy.

Ultrasonic therapy use in fixed frequencies in range 800-3000 kHz and lying far away threshold of hearing of human ear.

Graphically it has a sinusoidal shape.

Positive half-waves correspond to medium compression, negative to medium vacuum.

Ultrasound generated with the inverse piezoelectric effect. When alternating current feed in to quartz wafer, the latter change its thickness. And there is first exhaustion, then crowding of particles in adjacent to wafer medium, which is mechanical oscillation of ultrasonic frequency.

US is well absorbable by air, therefore the contact between the ultrasonic-apparatus and patient body must be air free by using vaseline, glycerine, lanolin, degasified water.

US can penetrate rather deep in to tissues:

- at the wave frequency 800 - 1000 kHz - to 8-10 cm;
- at the wave frequency 2500 - 3000 KHz - to 1-3 cm.

Currently fixed frequencies: 880 and 2640 kHz are used.

By using ultrasonic-therapy three factors are affects the human body: mechanical; thermal; physicochemical.

Mechanical factor – this is alternating acoustic pressure – “Micro massage”, vibrational factor.

Thermal factor – effect, determined by transformation of absorbed mechanical energy of ultrasonic waves in to heat.

Physicochemical factor – includes physical and chemical changes in tissues.

*Therapeutic effects:*

- pain-relieving;
- anti-spastic;
- vasodilating;
- resolving;
- anti-inflammatory;
- desensitizing;
- hypotensive and broncholytic;
- Support the peristaltic and secretory functions of GIT.

*Apparatus:* «UST-1» - frequency 880 kHz; «UST-3» - frequency 2640 kHz; «UST-13» - frequencies 880 and 2640 kHz.

*Indications:*

- osteochondrosis;
- neuropathies;
- neuralgias;
- spine injuries;
- contracture;
- diseases of internal organs.

*Contraindications:*

- hypertension of III degree;
- hypotension;
- ischemic heart disease with attacks of angina pectoris;
- cardiac arrhythmia;
- jejunal (postgastrectomy) syndrome;
- complications of ulcers disease;
- endocrine disorders;
- osteoporosis;
- thrombophlebitis.

**Phonophoresis of drugs substances**

Phonophoresis - it is a combination of ultrasonic and medicamental influence on human body.

Pharmaceutical substances includes in coupling medium: glucocorticoids; analgesics; spasmolytics; fibrinolytics and vessels regulation drugs.

Sudoriferous and sebaceous glands ducts are the ways which the medicines get to the tissues. Precellular and intercellular penetration routes are possible.

*Indications:* diseases and injuries of locomotive system.

Low-frequency ultrasonic therapy - 22-44 kHz for therapy of gynaecological and urological diseases (intra-organ methods).

## CONTENTS

<b>CURRENT APPROACHES TO THE PATIENTS AND INVALIDS REHABILITATION .....</b>	<b>3</b>
<b>PHYSICAL MEDICINE IN THERAPY AND REHABILITATION OF PATIENTS .....</b>	<b>11</b>
<b>ASSESSMENT OF MEDICAL REHABILITATION EFFECTIVENESS .....</b>	<b>18</b>
<b>GENERAL FUNDAMENTALS OF KINESITHERAPY.....</b>	<b>26</b>
<b>GENERAL FUNDAMENTALS OF THERAPEUTIC MASSAGE .....</b>	<b>32</b>
<b>PHOTOTHERAPY .....</b>	<b>41</b>

**Пирогова** Лариса Александровна  
**Хованская** Галина Николаевна

**BASICS OF MEDICAL REHABILITATION AND  
NONMEDICAMENTAL THERAPY**

*Course of lectures*

Подписано в печать 29.12.2009.  
Формат 60x84/16. Бумага офсетная.  
Гарнитура Таймс. Ризография.  
Усл. печ. л. **2,80**. Уч.-изд. л. **2,10**. Тираж **50** экз. Заказ **183 б.**

Издатель и полиграфическое исполнение  
учреждение образования  
«Гродненский государственный медицинский университет».  
ЛИ № 02330/0548511 от 16.06.2009. Ул. Горького, 80, 230009, Гродно.