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**APPLICATION  
OF ULTRASONIC WAVES,  
MAGNETIC FIELDS AND OPTICAL FLOW  
IN REHABILITATION**

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**To the memory of great scientist Professor Ivan Zakharovich Samosyuk  
dedicated**

The book presents modern data on the use of a resonant magnetic therapy, ultrasound and magnetic-laser effects. Describes practical techniques of the combined and the united use of these physical factors in the different sections of clinical medicine (neurology, cardiology, gastroenterology, gynecology, etc.).

The book also describes the modern principles of selecting impact zones, the rationale biorhythmological and resonance effects, the practical use of which is becoming increasingly important in physiotherapy and physiopuncture.

Most private techniques of magnet-laser-ultrasound therapy are described with respect to a new generation of devices of «MIT» series and the «MIT-31», which contains all three of these factors: ultrasound, magnetic field and laser radiation.

The book is intended for physical therapists, rehabilitation specialists, health resort, the doctors of narrow specialties, using methods of physiotherapy, as well as nurses rehabilitation centers, beauty parlor and a wide range of readers interested in the problems of sanitation.

Authors are grateful to Alla Tereshchenko, Yevheniya Gorlatenko and Olga Danilova for their assistance in the preparation for publication of the monograph.

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## ABBREVIATIONS

AP — acupuncture points  
BAP — biologically active points  
CMF — constant magnetic field  
EMF — electro magnetic field  
EMR — electromagnetic radiation  
LILR — low-intensive laser radiation  
MF — magnetic field  
MLT — magnet laser therapy  
MLUST — magnet laser ultrasound therapy  
MPLT — multipurpose laser therapy  
MT — magnet therapy  
PMF — pulse magnetic field  
POL — peroxide oxidation of lipids  
PT — physiotherapy  
REG — rheoencephalography  
RMF — rotating magnetic field  
SBR — secondary biogenic radiation  
SP — sonopuncture  
UCSG — upper cervical sympathetic gangly  
UPhP — ultra phonophoresis  
UST — ultrasonic therapy  
US — ultrasound



## INTRODUCTION

In therapeutic sections of clinical medicine and rehabilitation is constant competition between physical factors and spa treatments on one hand and the medication on another. Unfortunately, most of this competition ends in favor of the latter, not only because of the extensive advertising of drugs, and lack of good training doctors who can use modern methods of physiotherapy.

Undoubtedly, modern medicine has a significant arsenal of active medication which makes treatment of many diseases effective. However, the using of drugs on a wide scale in some cases causes of addictive, allergic reactions and also can make adversely affecting the patient's condition.

Advantages of the majority of physical factors consist in the fact that they stimulate the organ or functional system, normalizing its function, improving microcirculation and innervations and accelerating the biochemical processes taking place in the area affected by stimulating the immune system and the body's own forces to fight the disease or to prevent it without causing thus usually serious side effects. The above fully applies to the ultrasound (US) waves, magnetic fields (MF) and electromagnetic radiation (EMR). These «relationships» of the body and the physical factor are due to the fact that in essence the majority of the physical factors are the part of the natural environment for the body.

These data suggest the need for equipment and procedures, wherever provided for therapeutic or prophylactic use of simultaneous or sequential effects on the human body the main above-mentioned preformed natural factors - EMR, MT and UT. It is expected that such a combination will provide a significant therapeutic effect than their separate use. The first experience of such combination is already known - magnetic treatment is one of the best combination with medication treatment, which is well established in the practice of physiotherapy.

For over the past five years, we have worked out various options for physiotherapy effects using EMR, MT, UT. For this purpose, a special company «MEDINTEH» in 1995 developed a unique device «MIT-31», allowing to carry out separately and combined the low-frequency ultrasound therapy, laser therapy or magnetic laser with different variants of their therapeutic modulation frequencies and simultaneous action on three areas - central and peripheral nervous system and the area of pathology.

The device was developed under the scientific supervision of prof. Samosyuk Ivan Zakharovich and Chukhraiev Nikolay Viktorovich. In the composition of the design team included Zenchenko Vitaliy, Kholodenko Mamontov, Igor Popov, Elena Stanislavovna Strelkovskaya. In the modernization and organization of serial production of the device also took part Natalia Tishchenko, Dobrodomov Alexey Viktorovich, Artem Didenko.

Currently, the device is registered as medical devices in Ukraine, Russia and Kazakhstan. The device has the patents of Ukraine and Russia.

During clinical use of the device appeared some practical experience with the combined use of this few factors, which are set out in this monograph.

The authors sincerely hope that the proposed work will be useful not only for physicians, but also for a wide range of readers. Authors will greatly appreciate all comments and suggestions on the improvement of the content of the book.

The authors express their gratitude for the assistance in publication of the monograph A.P. Tereshchenko, E.Y. Horlatenko and O.A. Danilova.

## **Modern principles of choice of impact zones in the physiotherapy treatment**

In the modern literature on physical therapy (PT), researchers focus on the study of the mechanism of action of physical factors, their parameters and the various theoretical aspects of the problem [4; 7; 10; 14; 16; 28; 29; 40; 47; etc.].

There is no doubt about the importance of these issues, but however, there is no adequate attention of researchers to the choice of impact zones, to the specificity of the response when stimulation of one or another area, the adequacy of the parameters and factors, the physiological parameters of the zone.

Chinese physiotherapy (physiopuncture) - Zhen-chiu therapy more than 3 thousand years ago raised questions (and successfully solves them) about the site of action (selection of points of acupuncture zones), the exposure time (optimum time of the procedure, with the accounting of the diurnal, monthly, seasonal and others. biorhythms) and the method of exposure, providing an adequate method and strength of stimulation by the physical factor (acupuncture, acupressure, moxibustion or warming, etc.). [30]. All these questions are relevant for modern physiotherapy.

### **Lets speak in more details on the value of these areas for PT**

One of the most simplest and effective ways to select zones in the PT is the impact on zones of lesion. For example, when lumbalgia - pain zone, in the pathology of bronchopulmonary system - inhalation, in the diseases of the hepatobiliary system - on the area of the liver and gall bladder, changes in knee joints (gonarthrosis) - on the knee joints and others. This approach is widely used in the PT, however, it does not account for the pathogenic mechanisms of the disease and, therefore, does not enable more effective influence on the pathologic process. For example, in the development of gonarthrosis very important role plays the segmental formation of vegetative nervous system (L1-L3), the centers of which are trophic for the knee. Naturally, supplementary impact on segmental formation of vegetative nervous system is necessary, besides the direct influence on the pathological center will be more effective. This principle of zones choice in the practice of PT is called metameric or segmental (metameric-segmental) and is one of the most widely used.

In practice, the classic PT provides the use of three main areas, the principle of «three pillars»: cervical area, lumbar area and zones which are known as Zakhary'in-Ged's zone. The choice of these areas is not random and confirmed by numerous clinical results and theoretically justified.

Let us stop in more details on the importance of these areas in the practice of physical therapy.

## **Zones of Zakhary'in-Ged and metameric segmental principle of choosing zones in physiotherapy**

Priority in the description of special zones on the human body belongs to one of the founders of the Russian therapy G.A. Zakhary'in [46]. He was the first who clinically discovered areas of the body with a modified structure and drew attention to this fact, that in the presence of pathological process in the internal organs coming from them the pain is often projected in well-defined areas of the skin. The author gave a description of the phenomenon of pain palpatory – determined by pressure and the frequent presence of hyperalgesia in these areas.

Although up to the present time in many areas of the mechanism appearance Zakhary'in-Ged is not quite clarified, still in the pathogenesis of their formation important is the anatomical and functional (metameric) connection between the skin and the internal organs through the segmental apparatus of the spinal cord. The reason for their occurrence is pathological changes at the level of the autonomic nervous system.

With modern positions, Zakhary'in-Ged's zones can be interpreted as a zone with altered skin sensitivity and other tissues (muscles, bones) in the specific metameasure zone, the complex of vasomotor and motor-trophic reflexes, which is a kind of cutaneous projection of the metameasure of the diseased organ. In Zakhary'in-Ged's areas palpation are revealed trophic changes, soreness, pain, changes in the electrical conductivity of the skin, sweating, the changes of skin temperature and disorder of surface sensitivity, the appearance of a hyper- or hypo-algesia.

In this case, the size of zones, their resistance, the nature of changes in sensitivity and the electrical conductivity may be an important clinical factor in determining the dynamics of the disease.

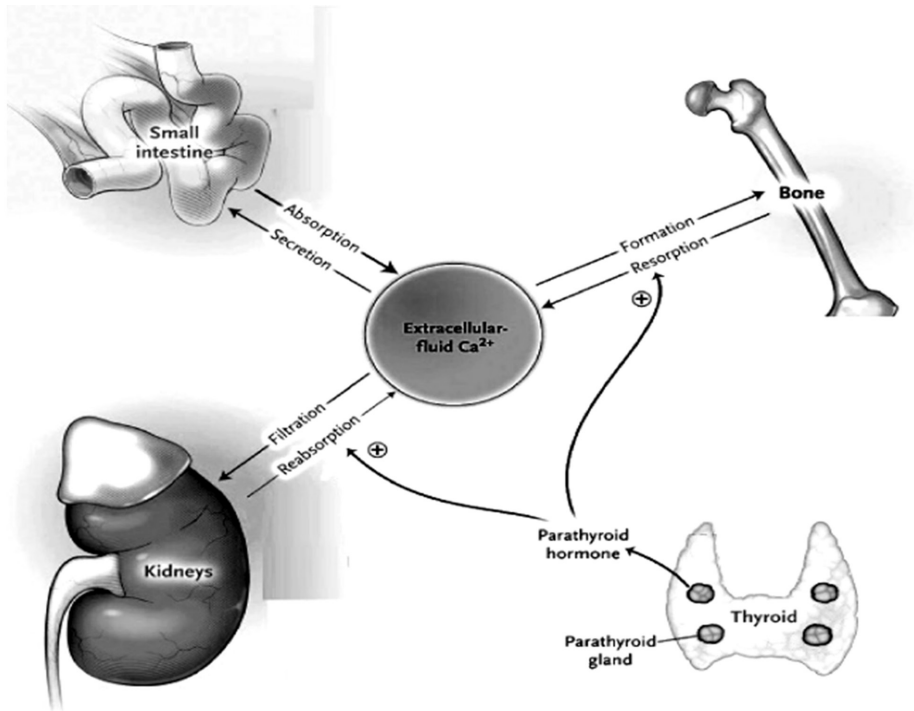
However, the value of these areas is important not only for diagnosis, but also for a variety of physical therapy options. The impact of physical factor on particular Zakhary'in-Ged's zone allows to selectively influence on the functional state of a particular organ. In fact we are able to make direct stimulation of the paths formed by disease, so we can speak about a kind of feedback principle: every internal organ certainly complies a specific area of the skin, and vice versa. Such feedback is, of course, realized through segmental apparatus of the spinal cord.

As it is known, the structure of the human body, to a degree, retains metameric

principle that is essential for selecting and understanding the impact zones of PT mechanisms.

The generality of vegetative segmental innervation of internal organs and certain metameres (i.e., when the source of the innervation of an internal organ, and certain metameres serve the same segments or the same autonomic forming) underlies metameric-segmental principle of the PT.

Close ties between somatic and autonomic entities at the spinal cord level, create preconditions for switching pulses from a physical body at the autonomic department and vice versa. For example, the influence on metamers D11-L1 (D10-D12) can affect the functioning of the basic parameters of kidney and adrenal gland (see Fig. 1).



*Fig. 1 Possible neurohumoral changes during stimulation of metamers associated with kidney function (as Yu.Natochinu 1985)*

This metameric principle of «small» physical therapy has been already described by M.N. Lapinski [23] and «disclosed» by classics of physiotherapy A.E. Shcherbak [34] and A. R. Kirichinsky [22]. It has found its application in the practice of acupuncture in the form of a recommendation of folk doctors of the East on the use of the so-called points of signaling or the herald points (this is nothing but the epicenter of zones of Zakhary'in-Ged) and sympathetic points (the latter are located in the same metameres as the internal organs and are recommended for the impact on them during diseases of these organs).

In the case of great power of the used physical factor, the initial response of the organism is caused by the neuro-reflex and humoral mechanisms. In the cases of the threshold value or above-threshold stimulus\*\* in response is involved segmental unit with the inclusion of the autonomic nervous system, and through the last - internal organs, blood vessels, and others. Most likely, that the therapeutic effect of a Zakhary'in-Ged's zone, by herald points (signal), trigger points, pain points is based just on a similar mechanism, i.e., metameric segmental principle.

Table 1 shows the segmental innervation of the skin and internal organs, by which you can choose more targeted area for PT.

*Table 1*  
*Segmental innervation of the skin and internal organs*

<b>Innervation area</b>	<b>Segments and nerves</b>
Face	Trigeminal nerve
Auricle	V, VII, IX, X pairs of cranial nerves, C2-C3
Back of the head, neck	C1-C3
shoulder girdle	C4
Radial half shoulder, forearm and hand	C5-C7
Ulnar half of the shoulder, forearm and hand	C8-D2
nipple line	D5
The lower edge of the costal arch	D7
The level of the navel	D10
The level of the inguinal ligament	D12-L1
The front of the thigh	L1-L4
The front surface of the tibia	L5

\*\*In this section, we do not dwell on the primary interaction of physical factors with biological substrate. These issues are widely debated in the literature (Bogolyubov V.M., et al., 1994; V.E. Illarionov, 1998; G.N. Ponomarenko, Enin L.D., 1998; Selitsky G.V. et al., 1998; G.N. Ponomarenko, 1999) and partially covered with respect to ultrasound, MP and EMF in other chapters. However, whatever the primary mechanism of action of physiotherapy, the subsequent reaction is developed with the inclusion of the nervous, endocrine and humoral immune and other systems. In the primary acceptance the physical factor is set to the impact zone, specificity, which determines the specificity of the response. Of course, for that particular response (no stress reaction!) Required value chosen stimulus (its power, frequency, wavelength, etc.), time and duration, the system state, on which the impact is directed. At low power, but adequate physical stimuli, they seem to play mainly the role of information and reference, which leads to the so-called bio-resonance therapeutic effect.

The back surface of the leg	S1-S3
The perineum, inner buttocks surface	S4-S5
Sympathetic innervation of the skin	
Face, neck	C8-D3
upper extremity	D4-D7
torso	D8-D9
lower extremity	D10-L2
Vegetative innervation of internal organs	
Heart	C3-C5, C8, D1-D3 (D4-D6)
Aorta	D1-D3
Lungs	C3-C4 (D1), D2-D5, (D6-D9)
Esophagus	D3-D5 (D6)
Stomach	(D6), D7-D8
Intestines	D6-D12
Rectum	S2-S4
The liver and gallbladder	(D7), D8-D10, L1-L2
The kidney and ureter	D11-L1 (D10-D12)
Bladder: walls	D11-L1
mucous membrane of the cervix	S2-S4
prostate gland	D10-D11 (D12, L5); S1-S2
Testicle and ovary	D10-L1, (L2)
Uterus: body	D10-L1
neck	S1-S4

However, the convergence of somatic and visceral afferent innervation occurs not only in spinal neurons and neurons of the reticular formation of the brain stem, hypothalamus, thalamus and cerebral cortex [2; 30]. These facts are the physiological basis for explaining the effectiveness of PT of the visceral pain and other pathologies. In these cases we are talking about multi-level principle of regulation of the nervous functions as a principle of the system [36].

## **The systemic principle of the human body functions organization and the selection of treatment zones, based on this principle**

In the process of evolution a multiple security regulation of the same functional-dynamic system has been developed (a kind of a stability system with the presence of 3-5 or more levels of its regulation). These facts formed the basis of the teachings of P.K. Anokhin and his disciples [21; 36] about functional systems. Under the functional system, these authors understood the dynamic, self-regulating organization, which selectively combine various organs and subsystems of the nervous and humoral regulation to achieve specific, useful for the organism results. An example of a multi-level organization of the system can serve as a breathing system.

In this system we can stand out:

- 1) the motor zone part of the cortex, which is providing a conscious (arbitrary) performing respiratory movements, cough;
- 2) the respiratory center\* of the medulla oblongata, which regulates involuntary (automatic) breathing;
- 3) segmental apparatus of the spinal cord, which is providing autonomic-trophic functions of both for the lung and the corresponding nerves and muscles;
- 4) the respiratory muscles and the nerves innervating them;
- 5) the lungs as an organ and the respiratory tract.

It is understood that in the treatment of respiratory diseases, it is important to influence on various levels (not one) of the respiratory system with the possible focus on one or the other levels, depending on the cause of the disease.

No less indicative is the use of systemic principles of sensitive (cortex↔brain stem, including eye bugor↔segments of the spinal cord spinal ganglia and peripheral nerve receptors) and motor function: the brain subcortex↔cortex↔the brain stem↔segments of the spinal cord↔peripheral nerves and osteo-muscular-joint apparatus.

Naturally, in the construction of treatment and rehabilitation programs should be taken into account the principle of organization of the nervous system.

For example, a multi-level, systemic approach to rehabilitation of post-stroke patients helps to «unite disparate functions» [11]. For example, electrical stimulation of paretic muscles (spasticity predominantly of antagonists) not only prevents the malnutrition, but also has a positive effect on brain neurodynamics. Effects on subcortical and stem structures (electric, central electroanalgesia, endonasal electrophoresis of vitamin E on Dimexidum et al.) helps to reduce muscle tone, which

---

\*Chemoreceptors of respiratory center subtly react to changes in gas composition of blood, tissue metabolism and reflexes from proprioceptors of the vagus nerve and respiratory muscles. This level of regulation of respiration is called the metabolic system of regulation of respiration.

is apparently due to the gradual recovery of cortical-subcortical relations, and active influence on the reticulo-spinal ways of the regulation of the muscular tone.

Regarding the increased muscle tone it should be noted that, in many diseases of the central nervous system (CNS) spasticity becomes one of the main obstacles to the restoration of motor function [6; 7].

A number of modern electrophysiological studies performed in patients with spasticity have shown that the latter is not a result of a breach of any single system or neurophysiological mechanism, as determined by set of violations at different levels of functional motor system, although it is realized mainly on the segmental level (hyperactivity of spinal  $\alpha$ -motoneuron, change in neuronal excitability of annular spinal cord circuits, pathological increase of polysynaptic reflexes etc.) [4; 5].

In patients with the pathology of central nervous system, such as cerebral palsy, is necessary the effective reduction of muscle tone, possible through the use of multi-level (systemic) principle of the regulation as follows:

- by influence on the motor parts of the brain cortex, subcortical and stem structures;

- by influence on segmental apparatus of the spinal cord\* and the autochthonous muscles of the trunk (the latter is provided by a bilateral innervation from the formations of striopallidarum system, so there is practically absent paralysis of the trunk muscles) and

- the third level of impact - on the paretic limb.

This approach was implemented by professor V.I. Kozyavkin [7] in the treatment of cerebral palsy. He named it the polysegmentary method. The therapeutic effect of this manipulation by the adequate methods was provided on all parts of the spine and the muscles (autochthonous muscles, segmental apparatus of the spinal cord and structures of the brain stem, by the manipulation of the cranial-cervical junction) and general kinesitherapy.

The importance of combining different variants of kinesitherapy and certain physical factors (perhaps in subthreshold doses in order to avoid increasing the tone of spastic muscles) in cases of spastic paresis, due to the fact that the corticospinal tract provides both function of efferent (organization of movements and the regulation of muscle tone) and functions of afferent neural pathways (delivery information the cortex, subcortical structures, the cerebellum and the reticular formation of the peripheral sensory receptors and spinal motoneurons) [6].

Application of physical factors (eg, magnetic therapy (MT) of a certain frequency - ion-parametric MT) for MR patients with diseases of the central nervous system also

\*A.M. Shelyakin et al. (1996), used to treat cerebral paralysis with the presence of hyperkinesis using the method of transcranial direct current stimulation, marked increase in the efficiency of these patients by 6 times compared with conventional methods. These authors recommend micropolarization spinal cord in alternation with epidural electrical stimulation of his spinal cord injury.



contributes to the normalization of ion exchange processes in the neuron. As a result therapy decreases the cell  $Ca^{2++}$  blocking calcium channels, leading to a decrease in excitation of motor neurons and consequently to reduction of spasm and spasticity of the flexor muscle [44; 14].

According to some authors antispastic effect of MT is superior of many known antispastic drugs [10]. But, the majority of drugs tend to act on any one link of pathologic system [4; 5].

For example, Baklafen acts on the reception of GABA- $\beta$  causing a reduction of the  $Ca^{2++}$ , but does not normalize the pre- and postsynaptic disinhibition in neurons [5].

A major shortcoming of antispasmodic medications is that they cause an increase of weakness in the paretic of muscles, which greatly reduces the effectiveness of the treatment the patients with post-stroke movement disorders [4].

Systemic and multi-level approach is needed not only to be applied for patients with motor disorders which are the results of CNS diseases, but also in patients with lesions of the peripheral nervous system. Thus, the effects on the motor system in patients who suffered from consequences of injuries of nerve trunks, polyneuropathy, should be implemented at the following levels: affected (denervated) muscles, nerve trunk or nerve trunks which are damaged; segmental level, that is, segments of the spinal cord, neurons which form respective nerve axons; suprasegmental centers, i.e. afferent centers of the brain, the effects on which contribute to a more rapid regeneration of peripheral nerve structures.

Also very important in these cases is to impact on the healthy side of body, because by the impact of the intersegmental connections (left and right spinal segments) are stimulated the segments of the affected nerve structures [8].

Such an approach in the PT may be called as system multi-level, it provides exposure to different levels of functional systems and contributes to «unite disparate functions» [41]. This approach can be implemented only by the methods of physical therapy and physiopuncture and virtually impossible by drug therapy.

Systemic multi-level principle of PT explains the possibility of compensatory reactions of the organism in various pathological conditions and is the basis of the sanogenesis.

It also gives the doctor a basis for the selection of optimal areas of exposure: in some cases is enough to impact on the unit of the segment of spine and the affected organ, others - requires to impact on stem of the brain or cortical parts of the brain, or a combination thereof.

Analyzing the current approaches in the choice of impact zones at PT it shows us the necessity to consider the dualistic base (systemic and anti-systemic) of any function regulation principle. There are many dual phenomena in biology: decompensation and compensation; assimilation and dissimilation; stress and protection; adaptation and maladjustment; the predominance of sympathetic tone and parasympathetic division of the ANS; pain and analgesic system; depression and euphoria and others.

At the same time, in many cases it is preferred to impact by PT not on the diseased system, but on the physiologically intact anti-system.

These data have been used successfully in the treatment of pain syndromes, when using a low-frequency electrical stimulation of the skin with short pulses (TENS), which excites the predominantly antinociceptive system and thereby suppress the pain. It is also important to understand that the activation of neurons in the pain system can be caused not only by harmful stimulus, but also by artificial (after long-term use of certain medications) or by the natural inhibition of the activity of the system which make the analgesic effect: violation of serotonin metabolic processes, synthesis of opiate peptides, changes in emotional tone and al.

The mechanism of occurrence of pain of central origin (inhibition of the activity of antinociceptive system) is the basis of the appearance of pain in the masked (hidden), depression, and disappearing in the appointment antidepressants or adequate physiotherapy methods (electric, central electroanalgesia et al.).

Unfortunately, it must be noted that there is a little demand on using the systemic and anti-systemic principle in PT, and it was not enough studied in the European medicine. The same can not be said about Eastern medicine, where these principles are widely used in the rules and the theory of 5 Elements («U-SHIN»). These rules are clearly defining the relationship of various organs and systems, such as the heart and liver, the liver and spleen, and others. The knowledge of these rules helps the physician to freely navigate in the selection of systems (and anty-systems) in each case and, in addition to the impact on the pathological system, to choose the system that can help the «sick» systems. Figure 2 shows the scheme of «relationship» between the main organs (systems, meridians), that regulates their influence on each other.

If we are referring to so-called organ-trophic principle of PT, when the impact of physical factors takes place directly on the projection of the required organ or some part of it, it should be noted some progress in this regard.

For example, when in the case of detection of initial pulmonary tuberculosis, as shown by our study [31], effective is the use of low-frequency ultrasound on a projection of focal changes in the lung together with TB chemotherapy. N.V. Karmazin [18] has convincingly proved the immunomodulatory prospects of the impact of various physical factors on the spleen. The influence of PT techniques on the blood becomes classical [43]. We study and have good results by direct stimulation of the endocrine glands using the physical factors [6, 47a, 33].

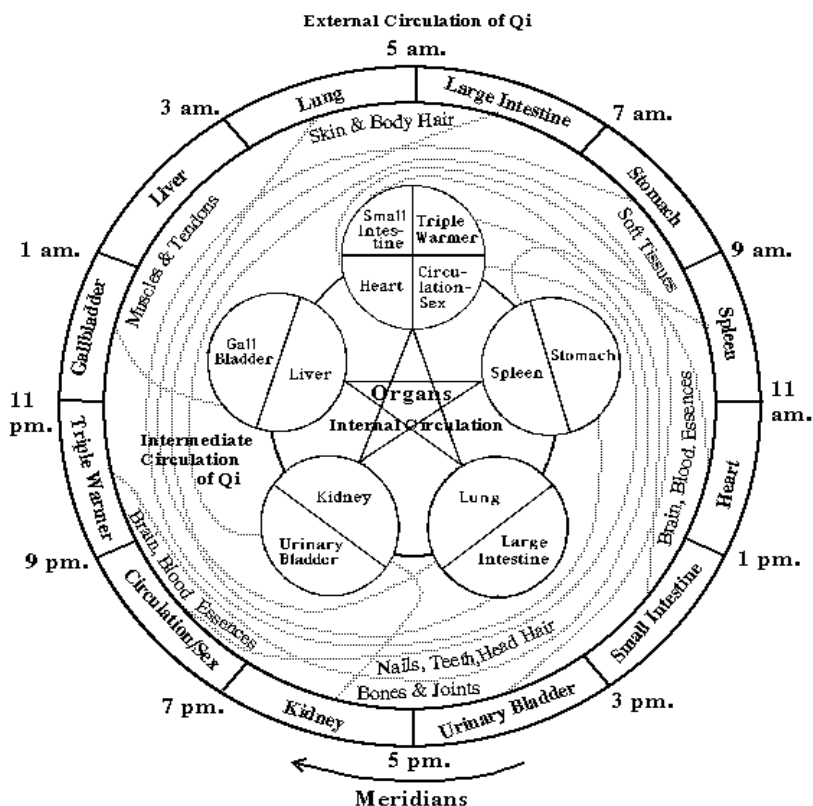


Fig. 2 «Interactions» between the main bodies (systems, meridians), which regulate their influence on each other (according to the theory of «U-SHIN» )

It is worth recalling that in the Vedic medicine the impact on the so-called chakras (which are the mostly projection on the skin of the endocrine glands) , a special importance were given to the choice of a specific color of stimulation (electromagnetic radiation of a certain wavelength).

So, for «sexual chakra» (sex glands, the first chakra, the area of the womb) need to act in red, on the chakra, located midway between the vagina and the navel (stimulation of the adrenal gland, the second chakra) - orange; on the chakra, located midway between the navel and the xiphoid process (the projection of the solar plexus, the third chakra) - yellow; on the thymus (4th chakra) - green; thyroid (5th chakra) - light blue; pituitary (6th chakra) - dark blue; epiphysis (7th chakra) - purple or white. In order to reduce the definite function of gland is require the effect of opposite color (contrast by Goering), which is causing the opposite reaction (photoreactivation). For example, if the thyroid gland has a hyperfunction it is good to wear amber (yellow), and this color makes the contrast to the light blue color, which is stimulating the gland.

*Table 2.*  
*Innervation zones and associated symptoms*

Vertebrae	Organs & Systems	The symptoms and pathological conditions
C1	The sympathetic nervous system, the brain, the pituitary gland, inner ear	Headaches, neurosis, migraine, hypertension, sleep disturbance
C2	Eyes, optic and auditory nerves, temporal bone	Allergies, fainting, diseases of the eye and ear
C3	Cheeks, face. The nerves of the teeth, the outer ear	Neuralgia, neuritis, acne
C4	The nose, lips, mouth, eustachian tubes	Hearing impairment, enlarged adenoids
C5	throat ligament	Sore throat, tonsillitis, laryngitis
C6	The muscles of the neck	Forearm pain in the neck, shoulders, back of the head
C7	Thyroid, shoulder and elbow joints	Hypotension, disturbance of mobility in the shoulders and elbows
D1	Hands, wrists, hands, esophagus,	Trachea asthma, cough, pain in the arms and hands
D2	Hands, wrists, hands, esophagus	Trachea arrhythmia, coronary heart disease, chest pain
D3	Bronchi, lungs, pleura, chest, nipples	Asthma, bronchitis, pneumonia, pleurisy
D4	The gall bladder and ducts	Stones gallbladder, jaundice, abnormal fat digestion
D5	Liver, solar plexus	Jaundice, liver disease, bleeding disorder
D6	Liver, solar plexus	Gastritis, ulcers, indigestion
D7	Pancreas, duodenum 12	Diabetes, ulcers, upset chairs
D8	The spleen, diaphragm	Hiccups, respiratory and digestive disorder
D9	Adrenal glands	Allergies, weakness of the immune system
D10	Kidneys	Kidney disease, fatigue, weakness
D11	The kidneys, ureters	Chronic kidney disease, impaired urination
D12	Small and large intestines, fallopian tubes	digestive disorders, infertility, diseases of the female genital organs
L1	The appendix, cecum, abdominal cavity	hernia, constipation, colitis, diarrhea
L2	Appendicitis, cecum, abdomen, upper thighs	Appendicitis, intestinal cramps, pain in the groin
L3	Sexual organs, urinary QSP, knee	The disorder of the bladder, impotence, pain in the knees
L4	The prostate gland, lower leg, foot	Sciatica, lumbodynia, pain in the knees, feet
L5	Legs, feet, toes	Swelling and pain in the ankle, flat feet

Sacrum	Thighs, buttocks	Pain in the sacrum
Coccyx	The rectum, anus	Hemorrhoids violation of pelvic organs

## **Special and specific zones of influence and their choice in the practice of physical therapy**

In physiotherapy, as noted above, along with the impact on the area of local pain or area of lesion, is used a choice of zones based on the systemic multi-level, and system-antisystemic metamericly segmental principles. Also are famous methods of PT, and continue being developed new methods of PT with special or specific treatment zones.

As previously mentioned, the area of cervical spine and lumbar area are widely used in the PT.

### ***Lumbar region***

The impact on lumbar region is of high importance, and it is recommended in the treatment of many diseases because most physical factors provide effective impact on the kidney and adrenal glands.

Figure 2 shows a certain degree of possible reaction of these bodies on the stimulation of spinal zones, which are responsible for their innervations. It becomes clear why the lumbar region is one of the «pillars» of the physiotherapy treatment.

### ***The area of cervical spine***

Influence on the neck region also on the region of the sympathetic neck chain, primarily for upper cervical sympathetic ganglion (UCSG) is recommended in various brain diseases. This is due to the specificity of these zones with respect to the brain function, its metabolism, and cerebrospinal fluid hemodynamic. It is known from classical neurology that autonomic centers of the spinal cord segments (C8-Th2) are the main source of autonomic (sympathetic) providing the head as a whole and skull contents in particular including blood vessels, vascular plexus of the brain ventricles and others. UCSG fibers is the peculiar manager of innervations in humans, they come from vegetative segments (C8-Th2) of the spinal cord.

From the latter (UCSG), the conductors of the autonomic sympathetic afferentation, are settling in perivascular plexus the external and internal carotid arteries, after contacting with the vegetative nodes (pterygopalatine, ear, ciliary and submandibular) are sent to the face and brain structures. Moreover, individual fibers from the autonomic node come into back roots of C1-C4 and then through the cervical inter-ganglion branch to the Th1-Th4. It turns out a kind of feedback: C8-

Th2 segments form UCSG, and from there on the said fiber arrives feedback, in fact, to the same segment. Indeed, the cervical region is a single whole.

It should also be emphasized that the second way of autonomic sympathetic ensure of the head and the skull contents is the vegetative perivascular plexus of vertebral artery.

Therefore, the only source of sympathetic innervations of the head, are the lower cervical and upper thoracic segments of the spinal cord, it's lateral vegetative horns that through these paths are sent to the brain and other entities of the head. This explains the importance of the impact on the neck and area of the collar. However, let us speak in more details on UCSG function and possible mechanisms of action of physical factors in its stimulation.

Even in 1930 E.A. Asratyan [3] noted changes in formation of food conditioned reflexes in dogs after the UCSG extirpation. These data had been later confirmed by other investigators [27; 38; 51]. The series of experimental studies and clinical observations have shown the role of the sympathetic nervous system, and in particular UCSG in auto regulation of cerebral blood flow [9; 54].

It is known that neurogenic, metabolic and myogenic factors are playing a leading role in the mechanisms of regulation of the cerebral circulation, including venous. At the same time, in neurogenic regulation the major role belongs to the noradrenergic intracerebral system (the brain stem structure, blue spot, and others.), which the UCSG has a significant impact on/ The hypo- or overproduction (secretion) of cerebro-spinal fluid (CSF) at pathology of UCSG is associated with the change in blood flow in the choroid plexus of the ventricles of the brain [50; 52].

These findings have been confirmed by long-term experiments with the electrical stimulation of UCSG [49]. There are studies (53), indicating a change in the content of RNA, the activity of RNase in sub cellular structures of the brain and the disappearance of noradrenalin in the pineal gland after removal UCSG.

In a detailed experimental work, G.A. Sokolova et al. [37] have shown a influence of the UCSG regulation on the energy metabolism of the brain and the cortex. The authors emphasize that only if a continuous energy supply, in synapses can be intense protein synthesis, polypeptides, neurotransmitters and other metabolites, as well as the taking part of the synapses in the nerve impulses.

These data largely explain the importance of using of the PT influence through the segments C8-Th2 and area of the UCSG, for actively influence the circulation of the blood and the energy processes in the brain. It should also be noted that the cervical region and these segments are the source of sympathetic innervations (through star node) of the chest, including the heart. Not surprisingly, the impact on the neck and collar area is one of the most popular in the PT, that is one of her «whales».

## *The trans-cerebral techniques*

The impact on the area the scalp and face by the variety of physical factors became constantly used in the practice of PT. Some of them (electric, central electroanalgesia, endonasal electrophoresis and electrophoresis by Bourguignon) have become classics, other options (effects on specific areas of the scalp) are being actively developed.

The impact on the area of the scalp is different both in terms of the adequacy of the choice of physical factor, of the choice of parameters and the area of influence.

For example, the technique and methods of endonasal Bourguignon are unique for the reason that during electrophoresis through these zones the drug can pass the blood-brain barrier. Of course, these data are taken into account in clinical practice, however, their further improvement also requires the study of the possibility of expanding the number of drugs used in these procedures, and options which can include combined endolumbar injections, endonasal injections of the medical drugs for severe neurological diseases and others.

Particularly noteworthy is the technique of transcerebral impact when, depending on the use of physical factors and its parameters, can be obtained diverse therapeutic effects: analgesic effect [1; 20; 26], vaso regulating effect [13; 24; 35], immunomodulatory effect [21; 25], the hormone regulatory effect of [11] antidepressant effect [39], and others.

The promising for the techniques of transcerebral physiopuncture is a «sighting» impact on the necessary areas of the cerebral cortex (motor, sensory, etc.) [19] or other functionally important structures. For example, the impact on the parasagittal region and the projection of the large brain tank.

The choice of these areas is due to the following facts. The projection of the parasagittal region corresponds to the superior sagittal sinus, and here there is a significant concentration of the arachnoid villi, is localized the top (large) upper anastomotic vein (vein of Trollyar), the parietal emissaries vein. These anatomical structures are directly related to venous circulation of the brain and resorption of the cerebrospinal fluid [5]. Specified zone is important in other aspects. Thus, according to Oriental medicine, there is localized (the epicenter of the parasagittal areas) the important energy area – point T (XIII) 20, which corresponds to the 7 chakra (Vedic Medicine) [30].

The functional significance of this area is confirmed by modern research. In the literature review about the melatonin and its role in Neuroimmunology, S.K. Evtushenko [45] draws attention to the fact that in the embryological period in this area are pawned the pineal gland (epiphysis). The role of this gland is now intently being studied by many scientists. However, it is already known that the gland secretes two important hormones - Epithalamion and Melatonin. The source of melatonin, serving the serotonin of the pinealocytes, which constantly and in a larger amount than in other organs were found in the mammalian pineal gland. Melatonin pharmacologically is less active than serotonin, but its sedative effects on

the CNS are more pronounced. The activating effect of serotonin is caused by the excitation of serotonergic systems of reticular formation of the caudal portion of the midbrain and the bridge. These nuclei, in turn, send the long descending axons in the spinal cord. Probably, this serotonergic system plays the most important role in the modulation of nociception, and in conjunction with the hormones of the pineal gland influence on the person's mood (depression to a great extent depends on the dysfunction of the pineal gland).

These facts also explain the results of the high efficiency of white light and phototherapy in the treatment of many types of depression.

Epiphysis actively affects the biorhythms of the organism, immune status and function of the pituitary. Interesting is the well-known fact that of the influence of light on the synthesis of melatonin and serotonin in the pineal gland depends on the state of the peripheral sympathetic innervation. These light effects are not observed when the both superior cervical sympathetic ganglia were resected[48; 55]\*.

The dependence of the functional activity of the pineal gland from lighting is an important prerequisite for the targeted use of light exposure in order to normalize its functions. In this case, if the direct photo-stimulation of the pineal gland is difficult because of its depth of occurrence in the brain (pineal gland is anatomically located in the rear of the III ventricle), the impact of it can be mediated through the zone embryologically associated with it, that is parasagittal region. It is possible, that the pulsed laser radiation in the infrared range can sometimes directly affect the epiphysis (penetration depth of about 7 cm).

Consequently, the impact on the parasagittal region in the treatment of many diseases, especially depression, in our view, is quite reasonable.

Selection the projection zone of cisterna magna that is cerebromedullaris for laser stimulation, EHF-therapy, etc. is also associated with the importance of this formation. It is known that the cisterna magna of the brain is an important regulator of movement of the cerebrospinal fluid, but, for example, skull trauma often involved in the pathological process. Normalization of its functions, reduction of reactive (inflammatory) changes is an important precondition for the normalization of the CSF dynamics. It should also be taken into account that in the projection of cerebromedullaris are laid important brain stem structures, including the reticular formation. Stimulation of these structures is directly related to the processes of sanogenesis.

Speaking about the specificity of the areas of influence, we have remembered about the high sensitivity of the following zones to physical factors: palms [17], feet [42], the ear [30] and others.

Particularly sensitive to the influence of magnetic field is the area of carotid sinus, the exposure to it can cause significant therapeutic effects (Fig. 3)



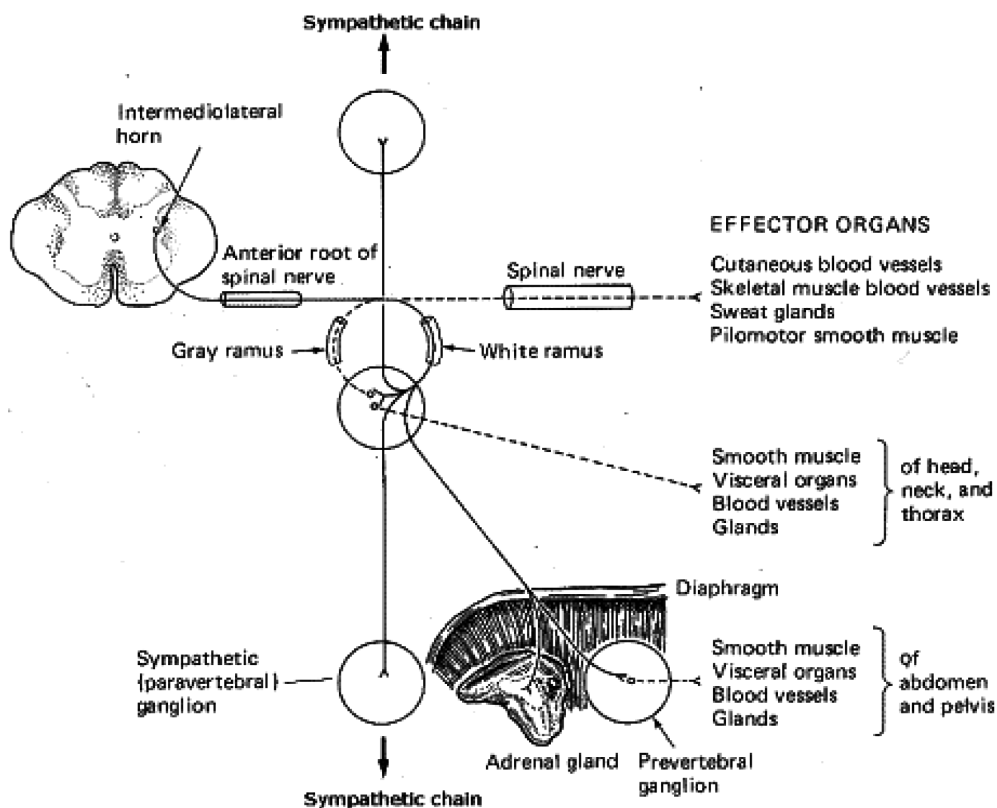


Fig. 3 Distribution scheme of reflexes arising, at the excitation carotid receptors.

Perspective are the hardware diagnostic methods in the choice of impact zones in the PT: they help to identify areas with low electric resistance and high potential, «interested» vascular pool on REG or Doppler ultrasonography[9] and others.

Useful in this regard are variants of acupuncture (system, meridian) diagnostics (method Nakatani, Akabane, Nogier, hardware pulse diagnostics, and others.), they allow to reveal the true pathological system on the preclinical level, thereby defining the zone of influence [30]. This last fact is particularly important in the prevention of exacerbations of the disease and in monitoring the effectiveness of treatment.

Thus, the modern PT has ample opportunities in the choice of treatment zones. It is important for every medical specialist to master the basic ones and skillfully use in clinical practice, bearing in mind that each zone has «individual» characteristics and requires adequate physical factor.

## Biological rhythms and bioresonance therapy

It is known that the functioning of the body, its systems, organs, tissues, cells and subcellular structures has rhythmic character with the presence of the large number of oscillating processes from the periods of daily, monthly, seasonal, annual and perennial biological rhythms till microsecond periods repeating the processes inside the cell. The main characteristic of rhythm is considered to be the frequency of the repetition process. V. P. Lysenyuk (1999), summarizing the literature data, gives the following classification of rhythms depending on the period and recurrence (Table. 1).

In today's presentation understanding the biological rhythms is «... swinging shift and intensity of processes and physiological reactions, which are based on changes in the metabolism of biological systems, due to the influence of external and internal factors. The external factors include: changes in illumination (photoperiodicity), temperature (termoperiodicity), perhaps the magnetic field, and the intensity of cosmic radiation, tides, seasonal and solar-lunar influence. Internal factors are the neurohumoral processes in particular, genetically fixed rate and rhythm» [BME, 1976, vol. 3, p. 157].

Probably biorhythmology can be described as the science of the nature and relationships of internal (endogenous) rhythms with external (exogenous) environmental rhythms.

Traditional Oriental medicine, based on the recognition of the unity and harmony of the deep relationship between man and the surrounding nature connects an assessment of the human condition and its treatment tactics with cosmic influences and terrestrial natural factors. Cosmic processes, solar flares and magnetic storms generated by them in the world, the movement of weather fronts and weather changes correlate with the incidence of colds, cardiovascular accidents (hypertensive crises, heart attacks, heart and brain infarctions), with the disregulatory aggravation and mental illnesses. It is expected that the solar activity and related geomagnetic disturbances cause misalignment of internal body rhythms with the rhythms of the environment (A.K. Podshibyakin et al., 1970). It is not excluded that the role of pacemaker can perform the geomagnetic field with the frequency of 0,1-0,006 Hz, and varies with solar activity changes (Y. S. Nikolaev et al., 1982). Founder of heliobiology A.L. Chizhevsky (1965) wrote: «At any given moment the organic world is under the influence of the space environment and in the most sensitive way reflecting itself, its features changes or fluctuations that occur in it. We are surrounded by the flow of cosmic energy, which flow to us from distant nebulae, stars, meteor showers, and it would be totally wrong to consider the sun's energy the only creator of life on earth. The living cell is the result of cosmic, solar and telluric influences, and is the object, which was created by the voltage of creative abilities of the entire Universe».

It is the rhythm of natural phenomena appeared as the background against

which proceeded evolutionary processes that, in turn, led to the emergence of biorhythmological activity in living systems as an adaptation mechanism to ever-changing conditions of life.

Indeed, it is reliably shown right now that the body is a dissipative (open) to external influences self-organizing system, exchanging with the environment of matter and energy, i.e. information, but is able to maintain functioning at a certain constant level, called «homeostasis.»

However, the concept of homeostasis from today's perspective, is not a strict constant of an index, and its fluctuations within certain limits. For example, fluctuations of glucose in serum from 3.1 to 5.5 mmol / l during a day is legal, and the fluctuations of total cholesterol in serum in different individuals 3,9-6,5 mmol / also is normal. Schematically homeostasis level can be represented as a kind of corridor (Fig. 4).

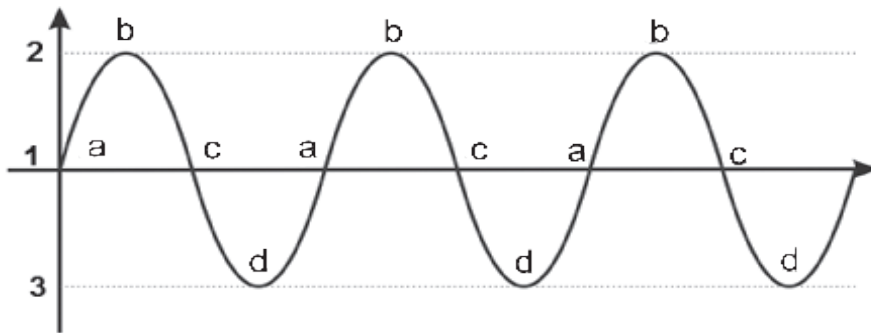
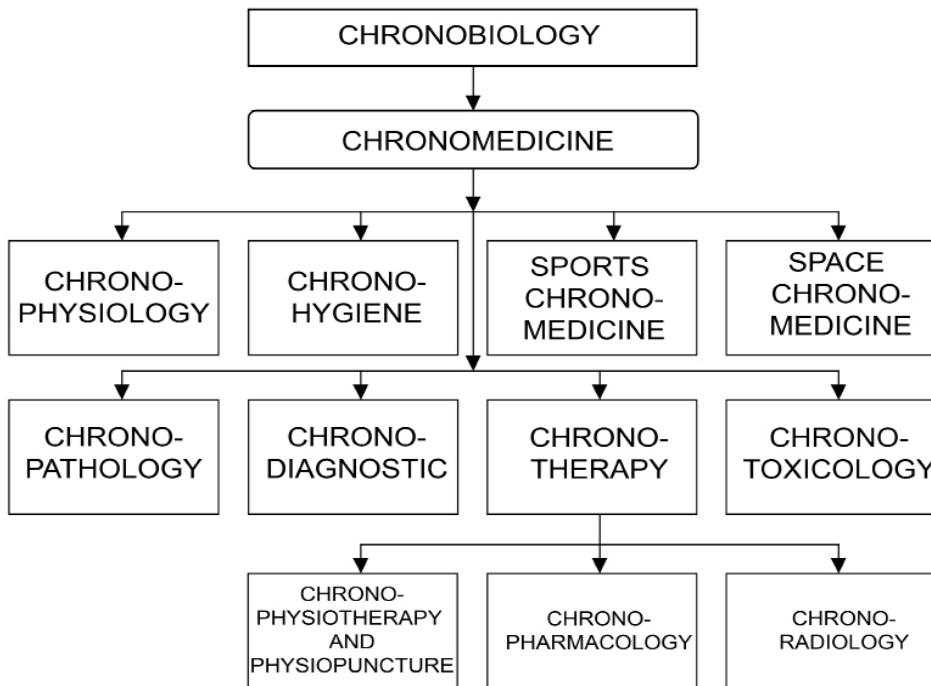


Fig. 4 1- the average (mean) value of parameters, which vary with respect to certain changes (e.g., average serum glucose - 4.3 mmol / l); 2 - upper limit of the corridor - the maximum permissible value of any function of the system; 3 - the minimum permissible value of the same function; a - knots in performance or function values (Anacrota); c - decline in value or decrease in function (catacrota); b, d - a plateau, that is, the achievement of the indicator or certain level of function: b - the maximum, d - the minimum value.

The fluctuation of certain functions, system components, and others within certain limits, respectively, is the «homeostasis», i.e. the ability to maintain function at an optimal level for the body. Stable inclusions of indicators above or below the corridor may indicate the inability of the system to compensate and the development of pathological changes in the form of hyper- or hypo function condition of the body or system. This principle «works» in diagnostic system «Ryodoraku» I. Nakatani and others. The oscillations (rhythms) themselves in physiological limits are necessary for the cells (the system) to be periodically moved from one extreme physiological state, which is dominated by anabolic processes, into another, wherein the catabolic processes dominate.

Knowing one or another biorhythms has not only theoretical interest, but also of practical importance, especially for physiotherapy and physiopuncture. It is no accident that in modern medicine stands out the subsection «chronomedicine» as the part of chronobiology (Fig. 5).



*Fig. 5 The Components of the chronomedicine in a section of chronobiology.*

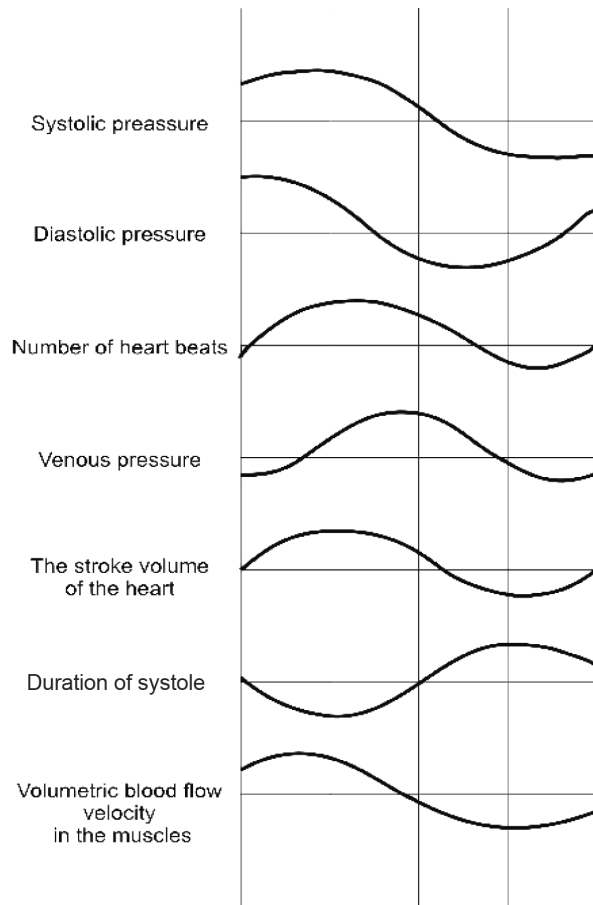
The modern tactics of the physiotherapy and physiopuncture (acupuncture, reflexology) - it is not only the selection of areas and the method of impact, but also the optimal time of the medical procedures.

Effective therapy is possible only at the individualization of therapy for each patient, which involves a detailed study of the original condition of the body, under which the patient's condition should be understood in a certain period of time (especially in the period of treatment) with strict regard to its individual features of the disease, the prevalence of a particular syndrome et al. The entire complex of therapeutic measures is built on the basis of these data, including physiotherapy. To understand the cyclical course of many diseases important is the teachings of the doctors of the Ancient East about the time of activity and passivity of meridians (Table. 3).

*Table 3.*  
*The impact on the sedative, tonic-points and on the points-helpers*  
*according to the hourly rhythm*  
*relationship of the (by I.Manaka, I. Urquhart, 1979, with amendments)*

Meridians	Activity period		Refuence period		Inaction period		
	Time, h	Sedative point	Time, h	Toning point	Time, h	Toning point	Point-to-aider
Lungs	3-5	P(I)5	5-7	P(I)9	15-17	P(I)9	P(I)9
Large intestine	5-7	GI(II)2	7-9	GI(II)11	17-19	GI(II)11	GI(II)4
Stomach	7-9	E(III)45	9-11	E(III)41	19-21	E(III)41	E(III)42
Spleen & Pancreas	9-11	RP(IV)5	11-13	RP(IV)2	21-23	RP(IV)2	RP(IV)3
Heart	11-13	C(V)7	13-15	C(V)9	23-1	C(V)9	C(V)7
Small intestine	13-15	IG(VI)8	15-17	IG(VI)3	1-3	IG(VI)3	IG(VI)4
Bladder	15-17	V(VII)65	17-19	V(VII)67	3-5	V(VII)67	V(VII)64
Kidneys	17-19	R(VIII)1	19-21	R(VIII)7	5-7	R(VIII)7	R(VIII)3
Pericardium	19-21	MC(IX)7	21-23	MC(IX)9	7-9	MC(IX)9	MC(IX)7
Three cavities of the trunk	21-23	TR(X)10	23-1	TR(X)3	9-11	TR(X)3	TR(X)4
Gallbladder	23-1	VB(XI)38	1-3	VB(XI)43	11-13	VB(XI)43	VB(XI)40
Liver	1-3	F(XII)2	3-5	F(XII)8	13-15	F(XII)8	F(XII)3

In modern interpretation it corresponds to the concept of circadian (daily, about daily) rhythms. At the same time the actual data of hourly daily activity of meridians coincide with the modern data on the functional activity of internal organs and body systems. Thus, the generalized data of Kiev and the region accident and emergency work show that in the morning (3:30 a.m. - 6 a.m.), the most frequent calls are to patients with bronchial asthma attacks, in the evening (5-8 p.m.) - to patients with renal pathology in the 23-3 h night dominated by calls to patients with pathology of the gallbladder and liver. It actually corresponds to the time of maximum activity of the meridians of the lung, kidney, gall bladder and liver. Features of the functioning of organs and systems of the body throughout the day associated primarily with the change of day and night (Fig. 6).



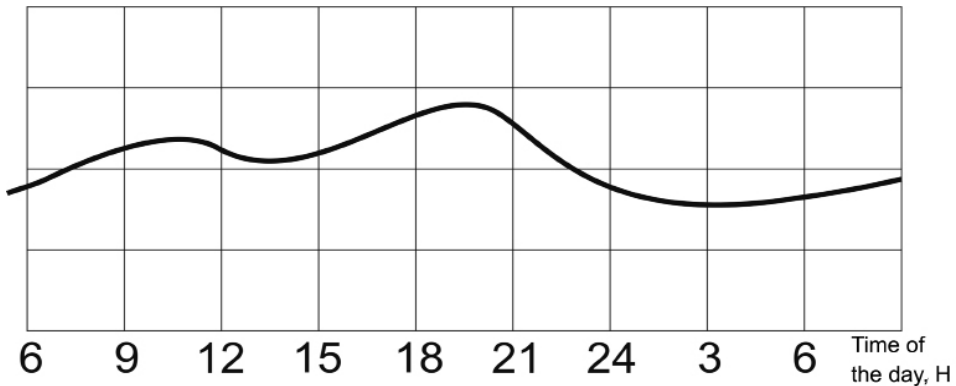
*Fig. 6 Daily rhythms (oscillation about the average daily level) of the cardiovascular system ( Zaslavskaya R.M.1979)*

It is obvious that there is no need for the equal work of all organs and systems of the body throughout the day. The nature of the process of evolution has provided the activity or inactivity of particular system (the body) in most suitable time frame for the body. It is clear, from this point of the activity of the large intestine channel (5-7 a.m.), since the active work (hunting for the ancient people, for animals - with the start of the day) digestive tract must be emptied. Then became too active the gastric channel (7-9 a.m.), presumably, this time was the most frequent for ingestion of food, which evolutionarily had established. Then, in the subsequent hours after ingestion will run channel of spleen, pancreas, etc., By these are explicable other meridians maximum activity at certain hours.

Thus, the liver channel is most active at night (1-3 a.m.), that is, while the parasympathetic nervous system (trophotropic) dominates over sympathetic, the liver's role in these processes is well known. The empirical data of folk doctors found the proof about the lung channel activity from 3 to 5 a.m. hours, as in these hours ( $\pm$

1 hour) the most pronounced is predominance of the parasympathetic part of the autonomic nervous system. The role of the lungs meridian is known in the occurrence of asthma attacks.

In recent years significantly has increased the interest in the characteristics of the daily functioning of organs and systems among European doctors. This is due to the need to research the people performance rhythm. (Fig. 7).



*Fig. 7 The daily rhythm (medium type) of human working capacity (by N. Aghajanian, 1980)*

Information about the rhythm of the body's functions is of great value to medical practice, because it allows to refuse from a template approach at prescribing the 1 tablet 3 times per day.

R.M. Zaslavskaya et al. (1987) showed that each patient has his own rhythm in blood pressure rise. By knowing it, your doctor may prescribe a drug 1-1.5 hours before the expected «jump» in a little bigger doses, but only once a day. The average course of such treatment is 2.5-3 times less than usual. A. Reinberg – one of the founders chronopharmacology – directly points to the dependence of the therapeutic effect and toxicity of drugs on time of the day. There is also other evidence of the activity of the organs and body systems increasing or decreasing periodically.

Knowing these facts allow to select optimal time of the appointment of a drug, and in relation to physiopuncture (reflexology) the time of the session. For example, in case of asthma it is important to arrange treatment so that the maximum concentration of drug in the blood was observed by the time the intended attack, which may prevent it. Using reflexology in such cases (prolonged exposure in the form of micro-needles, tsubo, magnitoforov et al.) the patient can massages the own imposed micro-needles by himself the day before the intended asthma attack to prevent it.

Folk doctors of East believed that acupuncture sessions carried out on the eve of the attack – is «to meet the tainted energy,» that is, to prevent attack by harmful

energy dissipation. In classical acupuncture it is considered that the greatest sedative effect of the meridian is reached during the period of its activity, and the maximum toning – at outflow period, that is in the next 2 hours after a period of activity or in the period of inactivity.

D.M. Tabeeva (1980) gives the following example. If after the diagnosis by acupuncture revealed that patient needs toning the channel of heart meridian, for the patient with heart disease is better to have acupuncture session at 1-3 p.m., or 3-5 p.m., rather than 11 a.m - 1 p.m. If patient needs to sedate the channel of heart meridian, it is better to have the acupuncture session at 11 a.m. - 1 p.m. In the Table 2 presented the data about the effect on the sedative and toning points, according to the relationship of hourly rhythm.

The knowledge about the rhythm of the organs and systems of the body helps doctor to accurately select the optimum time of treatment. In some cases it is possible to prevent the attack (e.g., asthma), in the other – to find the optimal time to strengthen the function of a specific organ or system. For example, for the treatment of chronic colitis with constipation the optimal time of physiotherapy – morning hours (7-9 a.m.).

For maximum sedative and tonic effect at regularly recurring attacks, such as migraine, at one and the same time (11 p.m.), you should not wait for this time to work on the point VB (XI) 38 (the optimal time for sedation in the meridian of the gallbladder). In this case, it is advisable to use the recommendation «to meet the tainted energy» because attack is easier to prevent than to stop. Therefore, in such cases is required the individual approach.

Knowledge about activity and inactivity of the meridians (organ systems) has a certain value in both - in the European medical tradition and in the diagnosis of acupuncture. For example, research on blood glucose test conducted in the maximum channel activity period of the spleen and pancreas (9-11 a.m.) and revealed the upper limit of glucose standards. There is no reasons for exclusion the diabetes in such cases, because during the activity of the channel, is marked a spontaneous lowering of blood glucose level to the lowest rate. The same is applicable to the study of the stomach functions where the conclusions about its reduced or increased functions without taking into account the time of the research are difficult.

If within certain period of time (week, month, year), the patient at a particular time has deterioration of heart or heart seizures occur, for example, from 11:30 a.m. till 12 noon, it can be assumed the heart channel function violation. It is known that the manifestation time (maximum severity or worsening) of a disease depends on compensatory possibilities of the system. Thus, diseases that occur with signs of hyper-function (excess), will be sharply active in the hours of maximum daily activity of the system, and diseases that occur with signs of hypofunction (lack of) are more pronounced in the hours of minimum activity of the system.



Thus, understanding the characteristics of the daily activity of organs and systems of the body not only helps to diagnose diseases (including acupuncture diagnosis), but also to choose the optimal time of medical treatment and physiotherapy. Currently, are known more than 300 physiological processes undergoing daily rhythmic fluctuations. Biorhythms are not limited to daily fluctuations, and as outlined above, are known monthly (lunar), seasonal, related to solar activity and other changes biorhythms.

Consideration of these rhythms, which are mainly related to the rhythms of the average frequency, meso- and macro-rhythms, is paramount in choosing the time of treatment or prevention of a disease at a particular time of day, week, month, season, etc. For example, for the prevention of exacerbations disease liver and gallbladder preferred spa or physiotherapy in winter, the cardiovascular system - in spring, broncho-pulmonary - in summer, kidney - in autumn, etc.

However, there are also high-frequency rhythms, characterized by rapid changes of oscillatory processes in an atom, molecule, cell, organ, system, etc.

Each organ is a complex rhythmic structure, characterized by a set of oscillating processes, differing in frequency and amplitude.

The presence of oscillatory processes allows to form new functional and dynamic links, depending on the specific needs of any organ or system, or the whole body, which is important in the formation of adaptive reactions.

In general, to get the maximum effect it is necessary to achieve resonance effect (it must be remembered that the organs and systems resonate not only to fluctuations of external factors that coincide with their frequency, but also on the fluctuations which are in multiple regard to them).

A popular explanation of the resonance effect can serve a classic example of two tuning forks. If you take two tuning forks of the same sound «la» or «si» and one of them is set stationary and the second to give the sound and put side by side, the sound starts after a few seconds of the first. This is the original variant of the same resonance tuning forks, which does not occur if the tuning forks have of different sound - «B» and «C», etc.

The biological response is a result of the sharp increase in the amplitude of the fluctuations in the biological system when subjected to outside forced vibrations at a frequency of the system, gradually approaching the one that the system has inside.

Achieving «resonance effect», when external oscillatory processes (physical agents) coincide with the internal, is an important and quite solved task.

It has been established that most disease begins from the arrhythmias with possible formation of the subsequent pathological process of functional system, and then certain organic changes.

According to modern concept the development of the pathological process can be divided into 3 passing stages:

- 1) Violations of the informational or information and energy level of interaction.
- 2) The emergence of a temporary error or disruption of the rhythm work.
- 3) Metabolic diseases and destruction of structures.

Therapy without frequency modulation acts mainly on the last stage, which is undoubtedly important.

However, normalization of body rhythm work, tissues, cells, or an integrated system is important in the treatment process for the recovery of their functional state. In these cases, it seems essential to choose such frequency characteristics of these effects, which would be made close to the frequency of oscillatory processes in the affected organ, tissue or system. In such cases, you can expect resonance: changed functional system of the body with its characteristic frequency and the impact frequency. Naturally, such a coincidence of frequency characteristics (resonance) will contribute to more rapid recovery of function, and subsequently of the the affected organs structure.

Consequently, the selection of appropriate frequencies for physiotherapy or physiopuncture is an important component in the treatment process. It is known that the low-frequency processes which are predominate, are reflecting the state of the functional-dynamic system and its metabolic status in the organs and systems of the human body.

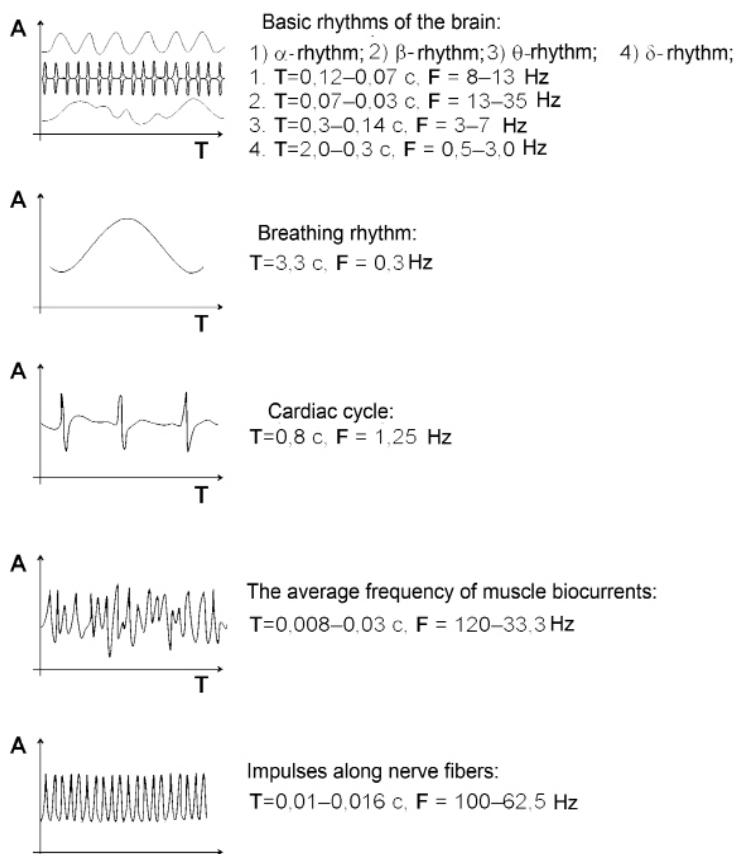
Figur. 8 shows some of the endogenous rhythms of human grouped by E. Kushnir (as amended).

For example, on the electroencephalogram the basic rhythm of a healthy person is alpha rhythm, its frequency ranges from 8 to 13 Hz (10 Hz on the average). In certain diseases of the central nervous system, when the percentage of the alpha rhythm is reduced as compared with the other (delta, beta, theta) rhythms and the modulation frequency it is recommended to use  $10 \text{ Hz} \pm 0,7$ .

It has been observed in cases of violation of cortical neurodynamics impact, with the red laser range (0.63 m) on the point MC (IX) 6, with early said modulation frequency, it results in recovery of the alpha rhythm in the occipital and parietal lobes of the brain after 3-4 session, while with frequency modulation to achieve this effect it is needed minimum of 8-10 sessions of laser puncture. Taking this into account at all diseases associated with impaired cortical neurodynamics, we recommend to set the modulation frequency of 9.4 Hz and act simultaneously on three areas:

- on the medulla oblongata area using red magnet-laser emitter;
- the corresponding spinal segments using magnetic infrared laser emitter;
- on the area of the affected organ using an ultrasonic emitter.

To treat the peripheral paresis or paralysis (neuropathy), it is also recommended to use low frequencies (18, 37.5, 75 or 10-100 Hz), because higher frequencies are beyond the limits for absorption by neuro-muscular system.



*Fig. 8 Some human endogenous rhythms.*

When using the low-frequency pulse make action is necessary to remember, that the length of the main enzymatic processes does not exceed 3-25 seconds (necessary dark period). Therefore, the minimum interval between the pulses of the impact should be at least 0.001 seconds in order not to interfere in already running enzymatic reactions. This corresponds to a frequency up to 1000 Hz (V.E. Illarionov, 1994).

The materials of the French association of «soft» lasers «The Lazer Focus» (1982) contain information that the root of many rhythmic processes in the body is «functional» (Universal) frequency of 1.2 Hz (1.14 Hz), the multiplicity to which is detected in many functional systems. This is the rhythm of cardiac activity, 72 beats in 1 minute (1.2 Hz  $\times$  60 = 72). The modulation frequency of 1.2 Hz is recommended for use in the treatment of focal infection, and twice as frequently (2.4 Hz) -for treatment of rheumatic diseases and also for the impact on sedative acupuncture points. Alpha-rhythm and tremor rhythm affecting capillary blood flow and vascular elongation is 9.4 Hz.

The same frequency is most effective when used in traumatology and for effect on the tonic acupuncture points to enhance the capillary blood flow.

18Hz is effective when exposed to signal points (heralds) and for excitation of the energy channels (V.E.Illarionov, 1994);

37.5 Hz, the frequency of calcium channels physical blocking - in diseases of the neuromuscular system and for influence on the meridian entry point;

75 Hz – the analgesic frequency and the frequency of analgesic effects and for influence on the meridian exit point;

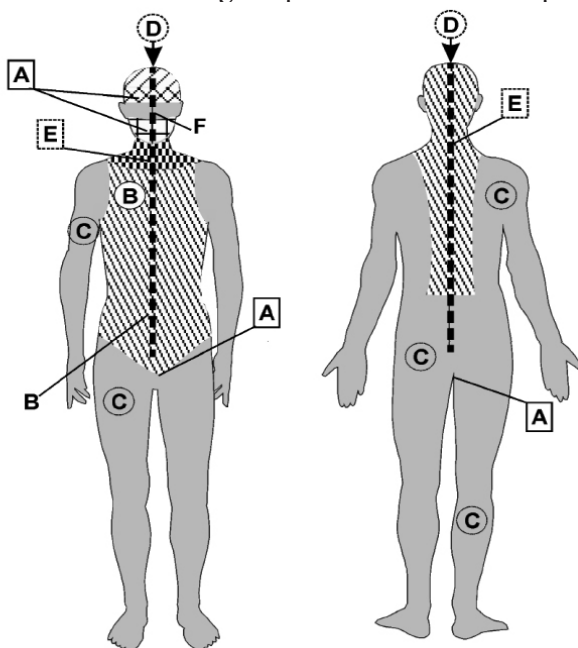
1-10 Hz for treatment of chronic disease and to stimulate regeneration;

10-100 Hz expedient to apply in case of organic pathology of the central nervous system and, if necessary, to cause vasodilation of large diameter (Z. Garnuszewski, 1995).

The impact modulated by low frequencies should be mainly used in the distal acupuncture points, signal points, and sympathetic points.

These recommendations are consistent with the classical ideas about the velocity propagation phenomenon of PSC (propagated sensation along the channels) along the meridians of 3.3-3.6 cm/s (Zhang Jin, 1979). The relatively low propagation velocity phenomenon of PSC (slow wave processes) requires adequate exposure, that is, the use of lower frequencies, calculated in units or dozens of hertz. Exposure to high frequencies (hundreds of hertz) will not be perceived by meridian system as frequency fluctuations, that is, the response of the system when exposed to high frequencies or continuous radiation will actually be the same type.

On the basis of various sources and the experience of using the «MIT-31» device can be recommended the following frequencies for local impact (Figure 9):



*Fig. 9 Frequencies therapeutic effect for various areas of the body by P. Nogier (1987)*

U = 1,2 Hz (universal, basic frequency);

A = 2.4 Hz, the mucous membranes of the lips, nose, inner ear canal, perineum (the mucous membranes of the genitals and rectum), the front surface of the chest (on the collarbone), the stomach;

C = 9.4 Hz triangular and navicular fossa, and anthelion antitragus the ear, upper limb with shoulder girdle, lower extremities with pelvic girdle;

D = 18 Hz, front and rear median lines (meridians);

E = 37.5 Hz, middle and lower third of the curl of the ear, the front of the neck from the lower jaw to the clavicle, head (forehead and nose to the eyebrows) and the rear surface of the head, paravertebral zone to the lumbar (L3 vertebra level);

F = 75 Hz base of the ear lobe, face (on the level of nasolabial junction and the entire lower jaw).

You should keep in mind that the selection of the modulation frequency in the treatment of various diseases is individual.

The probability of the high frequency rhythm direct assimilation by tissues and cells of the patient's body is higher than by peripheral structures. In this regard, the obvious is the fact that on the local areas (the area of affected organs) is necessary to act with high modulation frequencies (from 10 to 100 Hz) and on the distal acupuncture points – with low frequency (1 to 10 Hz).

According to our information such an approach is optimal for the treatment of many diseases, especially chronic of course.

Table 4 shows the resonant frequencies of the therapeutic influence in some pathological disorders.

*Table 4.*

*The resonant frequencies of the therapeutic influence, in some pathological disorders.*

Frequency, Hz	Diseases, conditions, syndromes, symptoms
1,2	The universal or basic frequency (the frequency of «superdelta» - the frequency of the heart rhythm). The main indications: diseases of the cardiovascular system, especially accompanied by heart palpitations, inflammation and autoimmune diseases, focal infection. Cardiopsychoneurosis.
2,4	Universal frequency multiple of (1.2 Hz) and enters the delta range of (0.5-3 Hz) brain biocurrents. Frequency of the delta brain waves have a sedative effect and promote the normalization of physiological (delta) sleep with insomnia. Stimulation of hormonal function in women (hypermenorrhea, menorrhagia, uterine fibroids). Dyskinesia of biliary tract, kidney disease, fatigue (tiredness), sinusitis, and headache associated with it, bruises, injuries from bruises, infectious and toxic liver disease, rheumatic diseases.

9,40±0,5	Frequency of the alpha rhythm spectrum (8-13 Hz) of brain biocurrents, frequency of tremor of capillaries and frequencies that are multiples to (0.1 Hz), alpha-rhythm of circulation. The resonant frequency of the release of ions. Increased efficiency due to the normalization of brain neurodynamics. Other diseases and symptoms: headache of various origins, essential hypertension, accompanied by angina, respiratory disease (obstructive bronchitis), insufficient function of the endocrine glands (diabetes, impotence), adnexitis, prostatitis, cystitis, tonsillitis, peptic and 12 duodenal ulcer, colon and other.
18,75	Diseases of the musculoskeletal system, phantom pain, burns, ophthalmic practice in patients with lesions of the cornea, acute respiratory infections.
37,5	Frequency of physical blocking of calcium channels ( $Ca^{2+}$ ), and diseases associated with this process (instead of antihypertensive drugs, calcium channel blockers, to reduce the spastic muscle tone in post stroke patients, cerebral palsy, poorly healing fractures, etc.). Diseases of the neuromuscular system, for losing weight, in violation of thermoregulation, tonsillitis.
75	Universal analgesic frequency, has antidepressant action, reduces fear, strengthens kidney function. It stimulates the «color» vision, it is also recommended for diseases of the respiratory system, increases the content of leukocytes in blood, stimulates lymphocirculation.
1-10	Scanning frequency (LF «swing») help the body to recover from physical and mental overvoltage (asthenic hypofunctional condition of the body), diseases of the cardiovascular system and parenchymal organs.
10-100	Scanning frequency (midrange «swing») has a sedative effect and normalizes hyperactivity conditions associated with neurotic disorders.

Studies have shown that each component of the functional system is unique to its own frequency range (biorhythm), which is associated with all spatial and temporal organization of the body. And this is true not only for the system, organ, cellular and intracellular structures, but also for the individual chemical components of cells, for example - lipids and nucleic acids. The resulting biorythmological activity has different levels between a strict mutually synchronized frequency phase and amplitude relationships.

Our bodies are equipped with the most perfect synchronizers, where in addition to the nervous system and other code-synchronizers play a role. For example, ciliate-

shoe, with no nervous system, lives, feeds, breeds, and all of these complicated processes are not chaotic.

Probably biorythmological (code-frequency) control is the most ancient (primary), which inherent to the simplest forms of biological objects, but have not lost its importance in the complex organisms in connection with the superstructure appeared - the humoral and neural regulation.

There are approximately  $10^{15}$  cells in the body, (a million of billions) and each of them has a specific function, clearly interacting with each other. Full control of this armada can not be managed even by the nervous system, which has only about a few billions of cells [109]\*. It is natural to assume that each of biorhythms, possessing a certain autonomy or self biorhythmological activity in general scheme is subject to the master control signals, that is, the synchronizing rhythm.

System or organ rhythms cover organs, systems and body as a whole, whereas the «molecular» (code-frequency) rhythms are present in the structure of the cell and the cell itself.

Human's and animal's body, is probably the union of the set of pacemaker elements, obeying one common pacemaker, and the latter is synchronized with the external periodic processes (A.E. Kushnir, 1999). For the de-synchronization of rhythms (appearance of the disease) or their recovery there is an important principle of biogenesis, which testifies the possibility of a quantized code transition of bio-system from one state to another, which is characterized as sporadic or chaotic.

According to this concept, any physiological variable, including heart rate should return after a disturbance to the value corresponding to the state of stable equilibrium, and the variations in heart rate – are just temporary responses to environmental fluctuations (Le Chatelier-Braun principle). However, it is more difficult to maintain a constant heart rate during the illness and its amplitude variation increases.

It was found that the heart and other physiological systems, when the body is young and healthy, can act abruptly, showing elements of chaotic behavior, and more regular operation, which is described as continuous functions is associated with aging and disease, so irregular and chaotic behavior is very important characteristic of the health. Reduced variability and emergence of permanent periodicity is often associated with many diseases.

Therefore, along with the widely known system of biological circadian clock, in response to a constant periodic changes, is simulated in living organisms the chaotic

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\* These billions of nerve cells vary in structure, although they are similar to each other. At the same time, our nervous system is capable of varying, highly diverse specific activities. What is the reason the specifics? It was found that the cause lies in the molecular organization of the surface of nerve cells and in the presence in each type of neuronal cell specific set of very complex molecules. Finding ways to influence these molecules, and accordingly to certain functions for which they are «responsible», it is needed to be addressed in various ways, including selecting the resonant frequencies for them.

dynamics is simulated. A similar pattern appears not only at the system level, but also as characteristic of the cell metabolism.

Thus, in the body of mammals, along with the well-studied nervous and endocrine systems, manages another information management system with a central pacemaker, which regulates the principle of the system frequency regulation. The main purpose of this system is to maintain activity and balancing of biorhythms of the hierarchically related functional systems (Fig. 10), which in turn are synchronized by exogenous environmental fluctuations (A.E. Kushnir, 1999).

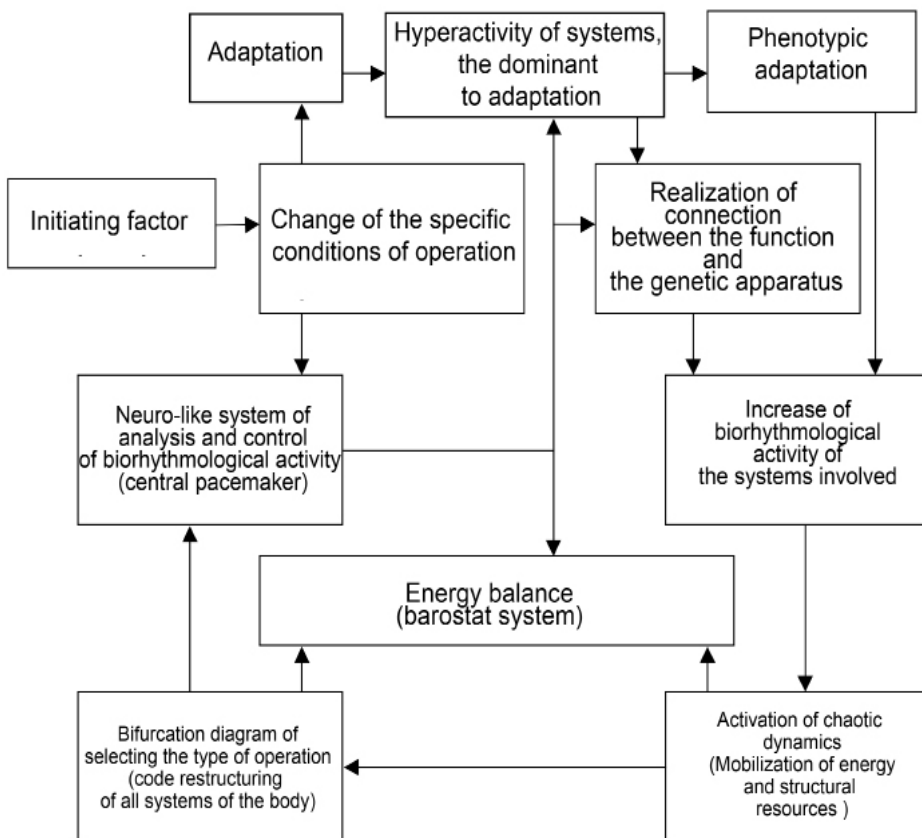


Fig. 10 Functional diagram of the frequency-code control (AE Kushnir, 1999)

Any functional system, organ, and even cells have a certain autonomy, but functional and structural reorganization of any system of the body leads to the consistent change of biorhythmological activity of functionally related systems.

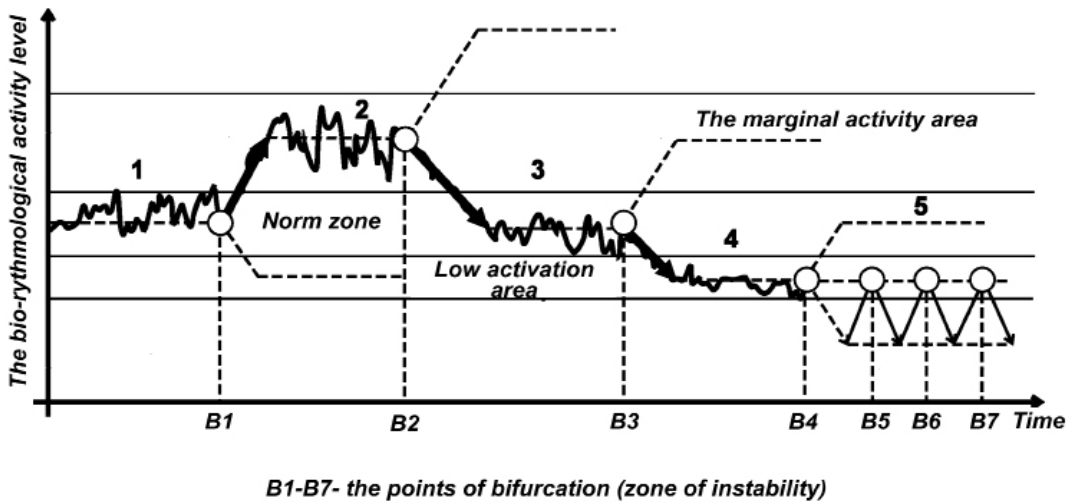
Possible fluctuations of biorhythms activities of specific functional systems are in strict accordance with its function, structure and reserves ATP free cellular energy determine its physiological corridor and adaptive capabilities.

The exit from a pathological condition is carried out by sequential saccadic bifurcation transitions from one biorhythmological state to another.



When we speak about the influence of physical factors, we need to know the essential parameters of the integrated spatial-temporal spectrum of it, which, in some cases, could serve as a pacemaker of the required rhythm ( the standard-informative role of natural factor with its appropriate parameters).

Figure 11, by A. E. Kushnir (1999), shows the variability of the chaotic dynamics of the system around the stable area (1), characterized by a strange attractor, with an abrupt transition (bifurcation point B1) to a new state in the area of sustainable limited activity. In the future, the system successively passes through the unstable state of bifurcation (point B2-B3) to a state with reduced biological activity. As can be seen from the figure, the higher is the level of biological activity, the higher is the level of variability of the system's chaotic dynamics.



*Fig. 11 The dependence of variations of chaotic dynamics of the system from time to time*

With reduced variability level (point B4) the unstable zone appears (5), characterized by a pronounced periodicity and limited cycle in the phase plane. Further evolution of the system is associated with the mobilization of its energy and structural resources, with the obligatory selection of one of the possible stable states (either reduced activity zone or pathological zone).

Naturally, the process of exit of the biological system from the pathological condition requires ATP cellular energy reserve resources which in an integrated system of organism are regulated by the general homeostasis system. The most effective way of targeted reallocation of existing reserved resources, in terms of their pathological deficit, is the direct transformation of the external influence energy.

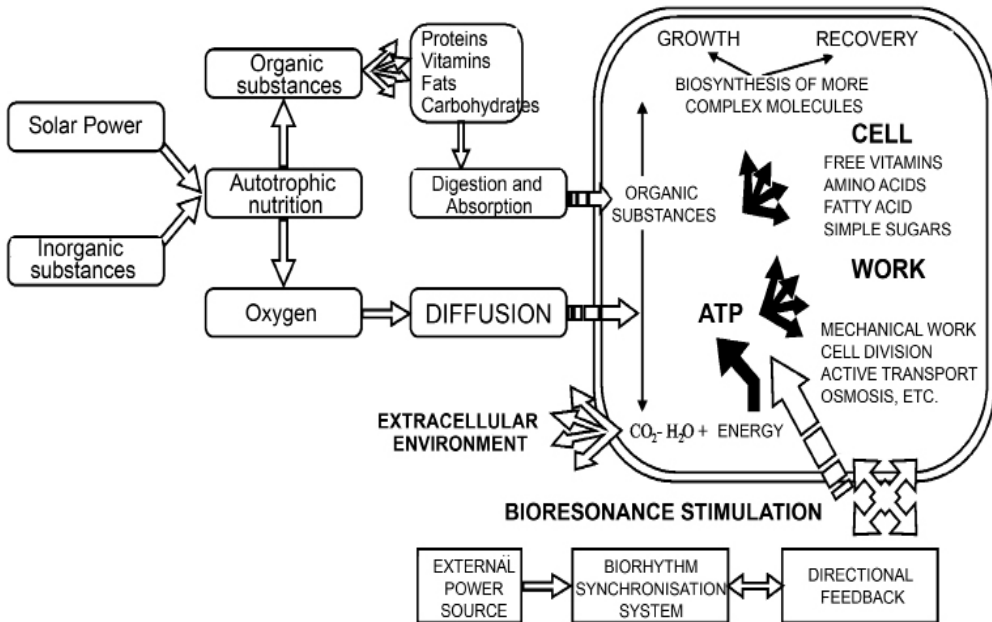


Fig. 12 Two ways of cells energy supply

Fig. 12 shows two ways of power maintenance of cells. First is provided with the serial conversion of solar energy into chemical energy by photosynthetic organisms, followed by further conversion and transportation the energy materials into the cell's structure in the form of ATP. And the second is the straight external energy transformation in biological cells works by using bio-resonance stimulation (A.E. Kushnir, 1999).

On the Fig. 13 is a diagram of the possible formation of pathological dysfunction due to exposure to stress factors and functions restoration with adequate bio-resonance therapy (A.E. Kushnir, 1999).

The presence of free external energy flow, without disturbing the overall orientation of the functional systems of the body, has a stimulating and normalizing effect on energy balance, blood circulation and lymph flow, metabolism, redox processes, membrane transfer, development of regulatory peptides, contributes to normalization of the tone of the autonomic nervous system, increase elasticity of blood vessels and in general improves the adaptive ability of the organism.

As a general rule, the final result of the treatment is restoration of the structural and energy ties and lost body functions.

An example of «resonant interaction» of physical factors and some of the biological object structures of is magnetic resonance imaging (MRI), as one of the most informative diagnostic methods. The main contribution to the observed signal of nuclear magnetic resonance (NMR) gives protons of intra- and extracellular water,

small hydrogen-containing molecules, and molecules with high mobility, for example, the lipids that make up fat tissue. The very intensity of the NMR signal is provided by the spin relaxation time of water protons under the influence of the radio-frequency pulse magnetic field of more than 2 T. Relaxation characteristics are mainly determined by the interaction between the spins, respectively, with the environment, and their mobility (frequency fields generated in their motion).

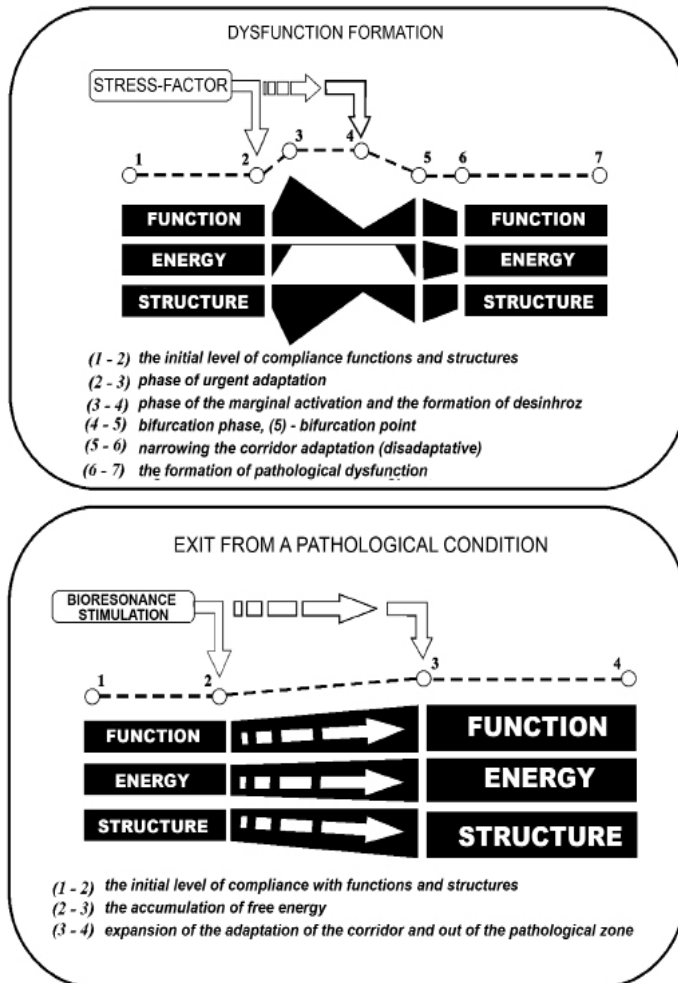


Fig. 13 The process of dysfunction forming and restoration of normal functional state

The essential matter for NMR has a content in biological tissues of the compounds having the so-called paramagnetic properties. The latter refers to such substances, the total magnetization of which (the sum of the dipole moments) oriented towards the external magnetic field (MF) and amplifies it (F. Bloch et al., 1946). A characteristic of the paramagnetic properties of substances is the presence in it of unpaired electrons

and nucleons, respectively. The electrons in the same way as the nucleons have spin angular momentum – own movement and their own magnetic moment. The magnetic moment of the electron is 800 times higher than the value of the proton and therefore has a significant effect on the magnetic properties of paramagnetic element (F. Bloch et al., 1946).

Elements with paramagnetic properties have unpaired electrons and are characterized by significantly larger magnetic moment. This class includes metals such as  $Mn^{2+}$ ,  $Fe^{3+}$ ,  $Ni^{2+}$ ,  $Cr^{3+}$ ,  $Co^{3+}$ ,  $Cu^{2+}$ ,  $Ti^{3+}$ , in which the paramagnetic properties are most pronounced, as well as elements of the rare earth group as  $Gd^{3+}$ ,  $Eu^{2+}$ ,  $Du^{3+}$ . Some of the latter ( $Gd^{3+}$ ), are used as contrast agents in MR imaging. Since the paramagnetic substances have large dipole moment, they contribute to the transfer of energy from the excited nuclei in the atomic lattice, and at the same time increase the heterogeneity of the MF.

These data about NMR effect indicate significant possibilities of physical factors to act on the molecular-atomic levels of biological objects, causing them to predictable changes. These data are confirmed by the so-called ion-parametric MT (Magnetic Tomography) (G.N. Ponomarenko et al., 1998; S.M. Zubkova et al., 1998; 2000).

Thus, until recently, the mechanisms of registered medical effects of magnetic therapy, most authors associate exclusively with the vortex electric fields emerging, leading to the formation of closed conduction currents (A.N. Kuznetsov, 1994). However, the level of energy of the magnetic interaction between the ions and biological molecules (10-19Dzh) on the 3 orders of magnitude lower than the energy of thermal motion of disordering (10-16Dzh) and clearly insufficient to change their orientation in space (A.R. Liboff, 1985). The existing linear models now can not explain the paradox of «energy». In this regard, it is difficult to predict the specificity and value of therapeutic effects of low-frequency magnetic therapy, as confirmed by controversial clinical observations (A.M. Demetsky et al., 1991).

In the last decade were offered another, non-linear models of interaction of weak magnetic fields with biological systems, in which the direct target of selective action of weak magnetic fields are cations. Thus, the model of the «cyclotron resonance» implies that the motion of ions along a helical path at accelerating cyclotron frequencies is defined by mutual influence of the parallel component of the DC and AC magnetic fields, the latter provides a selective energy absorption and increases their speed of movement in the ion channels of biological membrane (V.V. Ledneo, 1991).

Subsequent analysis showed that an increase in the probability of displacement the cations through the biomembrane can be achieved without external «pumping» of energy into  $\alpha$ -protein complex of ion channel, and by periodically changing of kinetic energy of thereon moving cations.

This model of the «ion parametric resonance» (IPR) suggests that a primary link in the chain of cooperative reactions of the biological systems is  $Ca^{2+}$  ion, specifically associated with the  $Ca^{2+}$ -binding centers of proteins which are messengers of action of

various stimuli on the metabolism of cells and other cations capable of modulating the kinetics of cell metabolism of enzymatic reactions (V.V. Lednev et al., 1996).

The model is based on the impact of IPR parallel directioned constant Bdc and variable Bdc of vector components of the magnetic field B. IPR can be observed in the amplitude of the alternating magnetic field, comparable with the induction of a constant magnetic field of the Earth (40-70 mT). The frequency of the alternating magnetic field, causing the IRP, is determined by the following expression.

$$f_p = \frac{1}{n} \frac{Bdc}{2\pi} \frac{q}{m}$$

where  $f_p$ — resonance frequency of the variable component of the field (Hz),  $q$ — ion charge (Cl),  $m$  — ion mass (kg), Bdc—induction value of the constant field (mkT),  $n$ —valence of the ion (an integer equal to 1, 2, 3 ...).

By now there is a sufficient number of experimental studies confirming the phenomenon of selective activation («oscillation buildup») of different cations at the frequencies corresponding to their IPR (the principal possibility of cation mobility modulation in biological membranes). At the same time, depending on the magnetic field parameters that meet the conditions of the IPR of various ions, it is possible to modulate the associated mobility (according to the electro-diffusion equation of Nerst-Planck) cation flow density through the biological membrane and the probability of their distribution between lipid and aqueous phases, is calculated by the Bourne formula.

The study, conducted by G.N. Ponomarenko et al., 1998, was made to evaluate the possibility of therapeutic use of the IPR phenomenon and clinical testing of the based on it fundamentally new method of magneto-ion-parametric magnetic therapy. The source of influence was a machine «Effect» (production of Research Institute of Traumatology and Orthopedics named after R.R. Vreden). It consists of two inductors and a control unit, that contains a control voltage source of DC and AC magnetic field and magnetometer with a remote measuring transmitter (accuracy of 0.01 mT). An analysis of its clinical effects, was conducted by the authors in groups of patients with the diseases, in the pathogenesis of which a leading role played the violations of  $Ca^{2+}$  exchange, – that are heart diseases, of vascular and musculoskeletal system.

Obtained positive results show the feasibility of introducing IPR-magnetic therapy in the treatment complex of patients with diseases of the circulatory system and the musculoskeletal system. In the mechanisms of action of MP, causing parametric resonance of  $Ca^{2+}$  ions, bringing the ion channel system – ion in unstable condition and the strengthening of small amplitude fluctuations of ions, which are inevitable in such an oscillating system, which is a living cell. In this system, there are always structures with the corresponding to own external MF oscillation frequency and synchronous

with its phase. The authors suggest that such structures may be the calcium cations, directly or indirectly involved in the implementation of reliably reported therapeutic effects. In these circumstances, the low-intensity MF enhances the amplitude of the oscillation and movement of such structures, which form the basis of generalized cooperative reactions that form the basis of «information» exposure.

Possibilities of active influence of certain parameters MF on the exchange of  $\text{Ca}^{2+}$  in the body is a very promising trend in modern medicine from the point of view of the uniqueness of the value of this element in the body.

Calcium is the basis of many metabolic and regulatory processes (just to name muscle contraction, blood sedimentation, hormonal regulation, vitamin metabolism and others).

For example, the level of vascular tone depends on the concentration of intracellular free  $\text{Ca}^{2+}$ , which is reduced (as well as the tonus of skeletal muscle and cardiac muscle) while  $\text{Ca}^{2+}$  reducing below  $1 \cdot 10^{-7}$  mol/l. Not coincidentally, calcium antagonists occupy a leading position (along with  $\beta$ -blockers, diuretics and peripheral vasodilators) in medical treatment of essential hypertension.

Particular importance has the breach of  $\text{Ca}^{2+}$  exchange with hypervitaminosis D in patogenesis of atherogenesis and calcification, and the presence of specific calcium-protein complexes\* can serve as molecular evidence of malignant neoplasms. This fact has been used successfully in Kiev for the past 5 years in the program «Onkotest».

B. Siesjo, F. Bengtsson (1989) formulated a unique theory of calcium overload, according to which an excess of intracellular  $\text{Ca}^{2+}$  in neurons leads to dysfunction of cellular structures of the brain with the formation of ischemic lesions. Such mechanism may be the cause of hypoglycemia, depression and other neurological diseases.

Consequently, the search for the physical factors, that can actively influence the exchange of  $\text{Ca}^{2+}$  in the body, is an important branch of modern physiotherapy and the use of the MF is one of the most promising directions.

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\* This calcium-protein complex in the brain is represented S100b- $\text{Ca}^{2+}$  - binding protein is synthesized by glia and has a predominantly glial localization (cytoplasm astrocyte), and is also found in synaptic structures and bodies of individual neurons. S100b is a trophic factor for serotonergic neurons. There are plenty of circumstantial evidence pointing to the fact that S100b functions relate to the regulation of the permeability of ion channels, as well as the integrative activity of the brain (the mechanism of learning, memory, emotional and motivational reactions). Change of content (an abnormal increase or decrease) of this protein in the brain tissue (for titer determination of serum antibodies thereto) characteristic for various pathologies of the nervous system (A.B. Poletaev 1995; G.V. Morozov et al., 2000) .

## Ultrasound therapy

Ultrasound treatment (UST), or treatment with ultrasonic waves (ultrasonotherapy), is the energy for therapeutic or prophylactic of inaudible to the human ear mechanical vibrations of an elastic medium with a frequency above 20 kHz, has found considerable application in medical practice. However, it should be emphasized that this unique physical effect can and should be more widely used in various fields of clinical medicine and, above all, in physical therapy offices, rehabilitation centers, sanatoria and health resorts and other organizations. There are quite a lot explanations and facts, that speak in favor of the use of ultrasound therapy. Consider the most important of them.

1) Ultrasound treatment (UST) is the unique physical factor that is capable to make «micro massage» of not only the tissues, but also of individual cells.

2) The ultrasound treatment has a universal therapeutic action, which consists of:

- cells and tissues mechanical micro-massage;
- the energy impact of ultrasonic waves on the body tissue with the formation of heat and activation of physical and chemical action (changing the course of oxidation - reduction processes, accelerating the digestion of complex protein complexes, activation of enzymes).

The ultrasound can be viewed as a kind of physical catalyst of biochemical, biophysical and physico-chemical reactions and processes in the body. Arising under the action of ultrasonic wave energy micro alternative changes in cellular structures, such as lipoprotein membranes of lysosomes, leading to changes in the homeostasis of the intracellular environment and activate sanogenetic mechanisms of intracellular regeneration, etc.

3) Ultrasound - is the ideal physical factor for combined use with pharmaceutical therapy, as he «loosens» histological barriers whereby the medicine circulating in blood may penetrate the pathological lesion in larger quantities. These facts are confirmed by modern clinical observations, such as the treatment of tuberculosis, when the combination of specific with the low-frequency ultrasonic treatment on lungs area leaded to several times faster recovery.

4) Ultrasound can be combined with virtually all types of physical therapy: magnetic therapy, electrotherapy, massages, balneotherapy, laser, EHF-therapy and other therapy options by electromagnetic waves, amplifying their effects.

5) Ultrasound intensity is easy to dose, and modern equipment allows us to accurately determine the depth of its penetration, allowing purposefully affect the organs and tissues depending on the depth of their location, using a low-, medium- or high-frequency ultrasonic vibrations. New perspectives are opened by using focused and modulated ultrasound.

6) Increase the ability of permeation of medications with phonophoresis is another feature of ultrasound, proving the feasibility of its application. In addition, the impact

of this factor changes (usually increases) pharmacological activity of most drugs, while it changes their pharmaceutical kinetics and dynamics. Medicines given with the use of ultrasound, acquire a new dimension of action - informational, which is close to the action of a well-chosen homeopathic remedies. Small doses of drugs that are entered by ultraphonophoresis and particular the phonophoresis kinetics (within an hour after treatment the drug appears in the blood, and after 12 hours remains the maximum concentration in the tissues within 2-3 days), confirm the very energy-informational mechanism of their actions. Consequently, phono-phoresis is not only the treatment by ultrasound and medicine, but also a kind of variant of homeopathy (small doses of drugs administered by ultrasound, but with sharp increase in the energy by its action), that will undoubtedly find further development.

7) Ultrasonic puncture is relatively a new trend in ultrasound therapy. It provides exposure to focused ultrasonic waves on biologically active points (BAP).

The advantages of these effects are obvious:

- high effectiveness of the procedures;
- the possibility of precise dosage of energy and depth of action (this is achieved by selecting the oscillation frequency of the ultrasonic waves, by additional modulation on the resonant frequencies of organs, as well as the use of special focusing nozzles);
- the relative simplicity of the procedure;
- compatibility with other physio-puncture options (magnet, laser, and other methods of EHF puncture therapy).

8) Ultrasound although is preformed physical factor, but it is natural and constantly surrounding people's environment, which we have not learned to use (or have lost the ability to!) to knowingly use in our livelihoods, unlike many animals (dolphins, whales, sharks, bats, etc. ). Probably the person perceives the ultrasonic vibrations on a subconscious level, and thus they affect many systems of the body. «Naturality» of this factor explains its main advantages:

- high efficiency and repeatability (reproducibility) of the results;
- the absence of allergies or intolerances;
- the lack of habituation or any significant complications while respecting the elementary rules of dosage;
- significant therapeutic corridor of the impact intensity: 0.05 to 1.0 W/cm (from 1 to 5 microns), which makes the use of ultrasound therapy practically secure.

It would also be emphasized that the ultrasound, as well as some other physical factors, has the main advantage – it causes the organism to fight the disease by launching and promoting the mechanisms of sanogenesis. The objective of any medical specialty is to pay attention to this aspect of the action of physical factors, and predict their use at home and, in general, in everyday life. How attractive the pharmacotherapy (under vital indications) wouldn't be, its usage should be limited



to «for health reasons», since in most cases it is not indifferent to human (allergies, addiction, side effects, or, often, small or short-term efficiency and etc.). Many of these unwanted side pharmacotherapy effects can be avoided by combination with physical therapy, i.e. physio-pharmacotherapy. The advantages of such combinations are expressed in increasing the effectiveness of the treatment, reduction of allergic reactions, a significant decrease of drug dosage and others.

## Basic terms and concepts

Today, a large number of produced ultrasonic therapy devices of various classes and systems are designed to affect areas of the body, from acupuncture points to reflexogenic zones of significant areas. Due to the large amount of exposure options (generating mode, the power of ultrasonic vibrations, etc.), many doctors practicing ultrasound therapy, often have questions about the difference between one or another kind of ultrasound exposure. For better understanding of the problem of ultrasound therapy in medicine it is vital to have a clear idea about the advantages and disadvantages of various methods of influence, to determine the specific type of ultrasound exposure with sufficient accuracy for each patient. To this end, we offer the reader to get acquainted with the brief characteristics of used kinds of ultrasonic therapy in everyday therapeutic practice, as well as the accepted terminology.

**Ultrasound** as an oscillatory wave process is characterized by a wavelength ( $\lambda$ ), period ( $T$ ), frequency ( $f$ ), vibration amplitude ( $A$ ) and propagation velocity ( $v$ ) in the medium. The main dosimetric parameters when performing ultrasound therapy are the power and intensity of ultrasonic vibrations, mode and duration of exposure.

**The oscillation amplitude** ( $A$ ) is the maximal displacement of oscillating particles from the equilibrium position. Determined in micrometers (microns).

In accordance with the requirements of National Standard low frequency ultrasound is dosed in the amplitude of oscillation. However, most physicians are accustomed to the intensity values. Conventionally, it can be assumed that the  $1 \text{ W/cm}^2$  corresponds to 5 microns in their therapeutic effect.

**Penetration depth** is the distance, passing through which the intensity of ultrasonic vibrations decreases by  $e^2$  (approximately 7.3) times. Determined in millimeters (mm). The depth of penetration of ultrasound in human biological tissues for different exposure is given in Table 5.

The depth of therapeutically effective influence of ultrasonic vibrations is in average of 4-5 cm, 5-6 cm is the maximum depth for ultrasound with a frequency of 880 kHz, and for 44 kHz – up to 10-12 cm. High frequency ultrasound with intensity of  $0.05\text{-}1.0 \text{ W/cm}^2$  is usually used for the treatment of pathological processes located in soft tissues and organs at a depth of 3 cm. To increase the penetration depth of the ultrasound in the tissue of the patient, use vibrations of low frequency (LF) – 22 and

44 kHz. We obtained maximum effect of low-frequency ultrasound, in the treatment of gynecologic, urologic and gastrointestinal diseases, in the treatment of diabetes, tuberculosis, and others.

Human body and its internal organs are acoustically «semitransparent» for low-frequency ultrasound, this makes it possible to influence them through the skin on which they are projected. For these purposes the ultrasound oscillations with amplitude of 2, 3, 4, 5 (before heating) are used. That is expedient to sonicate all tissues of human body with low-frequency ultrasound, including deeply located organs, including those containing a lot of air (e.g., lungs), bones and joints.

Ultrasound is absorbed by the tissues unevenly: poorly - in the subcutaneous adipose tissue, strongly - in the muscles, nerves, and especially in the bones, which is due to the properties of the tissues. The tissues which have supporting function and tissues which experiencing mechanical stress have a higher absorption than absorption in parenchymal tissue. The absorption coefficient for bones is 12-15 times higher compared to the muscle tissue. The depth of penetration of ultrasound in the bone is minimal and is about 0.3 cm.

The maximum ultrasonic energy is absorbed at the interfaces of different tissues: skin - subcutaneous fat, fascia - muscle, periosteum - the bone. In case of pathological processes the absorption of ultrasound changes. If the pathological process is accompanied by an edema of the tissue, the absorption coefficient decreases. Infiltration of the tissue by the cellular elements leads to an increase of the absorption coefficient.

**The intensity** is an amount of ultrasonic energy, passing through an area of 1 cm<sup>2</sup>, for 1 second. It is expressed in watts per square centimeter (W/cm<sup>2</sup>). In modern physiotherapy it is confirmed the division of ultrasound intensities on low (0.05-0.4 W/cm<sup>2</sup> – 1-2 m), medium (0.4-0.8 W/cm<sup>2</sup> – 3-4 microns) and high (0, 8-1,0 W/cm<sup>2</sup> – 4-5 microns).

**The power (P)** is the number of energy which emitted by full surface of ultrasonic transducer. It is determined in Watts, (W).

The experimentally and clinically substantiated the advantage of using of low-intensity ultrasound and is more appropriate for therapeutic and preventive effects.

If only ultrasound is used with low intensity (often W/cm<sup>2</sup> 0.1-0.3) with predominance of modulated or pulse influences and short exposures (several minutes), it acts as the catalyst of the biochemical, enzymatic processes and trophic activation underlying sanogenesis. The most effective exposure of ultrasound is in pulsed mode with an intensity of 0.1-0.3 W/cm<sup>2</sup>. In this case, we have the combination of low destructive reaction with high physical and chemical activity in the form of increased speed (fluctuations) of molecules. Under the influence of low-intensity ultrasound is marked the activation of microcirculation, increased membrane permeability and transcapillary exchange. Keeping this in mind, the procedure is advisable to start with

small doses (feeling weak heat on the skin in the affected area) and only after 3-4 treatments to move to medium intensity mode (the feeling of warmth on the skin in the affected area).

**Period (T)** - it is the time for which any point of the wave moves a distance equal to one wavelength. It is determined in seconds, (s).

The mode of generating ultrasonic waves specifies the ratio of the emission time between the ultrasonic waves and pauses there between. The mode may be continuous (no pause between the pulses), which is modulated (additionally performed modulation of ultrasonic vibrations at the resonant frequencies of bodies) or pulse (oscillations in separate bursts). In case of using modulated or pulsed mode with the same vibration intensity for the same time the average energy radiated is less than at continuous exposure.

**The propagation velocity (v)** is the distance by which any point of the ultrasonic wave moves per unit of time. It depends on the properties of the medium, in particular the density, elasticity, compressibility coefficient, molecular structures, temperature and the like, that is, the acoustic impedance of the medium. Determined in meters per second, (m/s).

The propagation velocity of ultrasound in solids is more than in liquids, and in liquids is more than in gases. In muscle tissue ultrasound propagation velocity (at a frequency of 880 kHz) typically is 1540 m/s, that is, close to its propagation velocity in water. But in bone ultrasound propagates faster – at about 3400 m/s.

**The oscillation frequency (f = t/T)** – the number of complete ultrasonic oscillations per unit of time. Determined in hertz (1 Hz – one oscillation per second); kilohertz (1kHz = 10<sup>3</sup> Hz) and megahertz (1 MHz = 10<sup>6</sup> Hz).

Between the wavelength ( $\lambda$ ), velocity (v) and the frequency (f) of ultrasonic vibrations there is a dependence, which is expressed by the formula:

$$\lambda = f/v$$

Ultrasonic waves in a homogeneous medium extend almost rectilinearly, easily focused, are reflected from the boundaries of separation media, and are characterized by the phenomenon of diffraction and interference. Reflection, refraction, and absorption of ultrasonic waves are mainly determined by acoustic impedance of the medium, the oscillation frequency and the angle of incidence of ultrasonic waves. Due to the fact that the ultrasonic waves are absorbed rapidly by air environment and they are reflected from air space which is boundary with the biological tissues (99.7%), the effect of ultrasound on the human body is held through the contact space (degassed water, vaseline, lanolin, paraffin oil, glycerine, and etc.). With the increasing of ultrasonic vibrations frequency increases their absorption medium and decreases the depth of penetration in the body tissue. Furthermore, the amount of absorbed ultrasonic energy depends on the type of the sonicated tissue: the most is absorbed by bones, then less - by nervous - and very little by muscles and fat. Attenuation, i.e. total

loss of acoustic energy in biological tissue is due to the combined effect of refraction, reflection, scattering and absorption of ultrasound.

## **How ultrasonic waves affect the body**

Penetrating into the body, the ultrasound provides a complex biological and therapeutic effect on it. The major importance in mechanism of ultrasound action on the body play the following factors: thermal (non-specific), the mechanical and physical-chemical (specific).

The thermal factor is related to the processes of heat generation at absorption of ultrasound in biological tissues. The absorption depends on the type of sounded tissue, and the frequency of the ultrasonic vibrations. According to theoretical calculations, the ultrasound absorption coefficient for a single type of tissue is proportional to the square of the frequency. In practice, however, this dependence can vary from linear to quadratic, so low-frequency ultrasound penetration ability is much higher than with HF. Thus, high temperature zones are formed unevenly in the body.

Most of them occur at the interface of the spaces, due to the difference in acoustic impedance and the formation of highly damped shear (transverse) waves, as well as tissues, that absorb ultrasonic energy (nerve, bone), and in the areas which poorly supplied with blood, because the latter removes heat, therefore, there may overheat. Because these tissue have no thermoreceptors virtually there is no possibility to feel the local temperature rise. Pain receptors are stimulated, and the patient feels pain only when the local temperature exceeds 45° C. Most authors believe that the short-term rise in temperature to 45° C is not dangerous. To avoid overheating of tissues with ultrasound therapy it should be preferred the labile technique.

The consequence of the thermal effects of ultrasound can be considered as an increase in the flow rate of metabolic processes, the occurrence of temperature gradients, which improve blood- and lymphocirculation, improve tissue elasticity, etc.

Mechanical factor appears due to the alternating acoustic pressure and manifests itself in a kind of «micro-massage» at the cellular and subcellular levels. Thus there is an increase in the permeability of cell membranes, thereby facilitating the transportation process of substances through the membrane and consequently increased the penetration of substances into the cell and the body as a whole. Equally important the effect of depolymerization on hyaluronic acid, which is made by ultrasound. The activation electrokinetic (electrocapillary) phenomena is observed in the micropores at the interface with different acoustic impedance, which plays an important role in phonophoresis. Then the acoustic micro-flows emerges in the protoplasm, the movement of intracellular inclusions and the change of their spatial relative position that causes stimulation of the cellular elements functions and cells in general.

Physico-chemical action is due to the fact that sign-variable elastic fluctuations cause a mechanical resonance in the tissues. As a result of this, the movement and

oscillation of molecules is accelerated, intermolecular bonds are weakened and, as a consequence, increasing their decay into ions that leads to the formation of new electric fields, isoelectric state is disturbed; electronically excited states appear and electrical changes occur in cells and tissues. The tribo-luminescence of water, serum and other fluids is observed, the structure of water and the state of hydration shells is changed: biologically active substances are released, free radicals are formed (HO, H, HO<sub>2</sub>, singlet oxygen) and a variety of products of biological solvent which were made by sonolysis, the processes of lipid peroxidation are changed. Physico-chemical and biochemical processes in tissues are intensified. This is particularly reflected in the change of mitochondrial oxidative phosphorylation of the liver, the kidneys, the intensity of tissue respiration, glycolysis processes and the activity of the pentose phosphate pathway of carbohydrate metabolism, revitalizing of proteins and nucleotides metabolism enhancing mitotic cell's activity.

The effect of all three factors (thermal, mechanical, physical-chemical) is closely related to each other and has combined action on the body. Under the influence of the ultrasound the intracellular microflows by rotational movements of the cytoplasm occur, which contributes to stimulation of cell elements functions and cells in whole. The ultrasound energy exposure on cellular structures, including liposome lipoprotein membranes, lead to changes in the medium and intracellular homeostatic mechanisms, activate defense responses, the intracellular regeneration of other processes, which is important in the mechanism of action of ultrasound.

Thus, ultrasound may be considered as a physical catalyst of physicochemical and biophysical processes within the body.

### **The therapeutic effect of ultrasound waves\***

The therapeutic effect of ultrasound depends on the frequency of the ultrasonic vibrations, the intensity, the exposure time and the body's condition. With the optimal variants of ultrasound exposure, it alters membrane permeability, enhances

\* In a simplified version these factors (micro, fever and acceleration of physical and chemical processes) produce the following medical and physiological effects: improving local circulation, which leads to improved metabolism; the temperature rise lead to the expansion of blood vessels (more evident in the continuous ultrasound); the increase in capillary permeability results in rapid absorption of tissue fluid perspired; improving local circulation and a decrease in sympathetic activity leads to a marked muscular relaxation; decrease in local ischemic pain; conversion of the sol into gel takes place as a result of the conversion of fibrinogen to fibrin, and bruising and swelling to a gel. Ultrasound dissolves the gel and accelerate the reabsorption. Since the conversion of fibrinogen to fibrin is the main characteristic of the healing process (scar formation), we do not recommend the use of ultrasound in the acute post-traumatic period. As a result, the above effects improve the capacity for tissue regeneration.

the diffusion and osmosis processes, increases the activity of ions, hormones and other biologically active substances due to their transition to a free state, it activates the enzyme activity, and increases metabolism. By the influence of ultrasound, the bioelectric activity of tissues is improving, increases the phagocytic function of leukocytes, the mechanisms of nonspecific immunological reactivity of the organism are activated, and also by increasing the histamine binding by blood's proteins and the splitting it by histaminase.

Under the influence of ultrasonic vibrations the local blood circulation improves, lymph flow, accelerate reparative processes in the nerves, bones, muscles, normalizes the activity of the cardiovascular system, respiratory function, increases the absorption of oxygen to tissues.

Micro massage with ultrasound has the anesthetic properties, stimulates the activity of the nervous and endocrine systems, improves the functional state of connective tissue, and increases the protective reaction of the human body.

Ultrasound therapy has a significant anti-inflammatory, antispasmodic, resolving, trophic, analgesic, and hiposensibilic fibrinolytic effect, stimulates regeneration processes, promotes the resorption of adhesions and scarring. The latter is associated with the activation of intracellular processes of protein synthesis, and enzymatic reactions. It was found that the scar tissue which was formed under the influence of ultrasound become firmer and more elastic.

Ultrasound affects the location of the newly forming collagen and contributes to the recovery process, and at the same time it increases the strength of scar tissue. However, the ultrasound influence on bone in proliferative stage of inflammation leads to slowing the differentiation of osteoblast and enhancing cartilage growth.

The ultrasound effect on the connective tissue is manifested by rejuvenation by its cellular composition and fibrous structures. In mast cells is marked a transient infiltration of histamine with quick activation of diamine oxidase, binding and neutralization of the excessive amounts of histamine by the blood proteins, free heparin (mast cells) and the normalization of the blood coagulation system. At ultrasound treatment procedures it is revealed the increase of the body's resistance to histamine shock, anaphylactic and allergic reactions, activating effect on phagocytosis.

In an experimental model of the disease, the action by ultrasound of low intensities inhibits the development of degenerative process after joint injury, stimulates the consolidation of the bone after a fracture and bone-plastic operations, promotes the resorption of the inflammatory infiltrate in damaged disc with osteochondrosis, improves recovery of the fibrous ring structure and the nucleus pulposus, with the accumulation of glycogen and acid mucopolysaccharides in the last.

When the skin is exposed to ultrasound, it enhance physiological and reparative regeneration in the skin, increasing its permeability, redox potential and active reaction (pH) changes, skin excretory function activates (increasing the number of functioning sebaceous and sweat glands), and increases the excretion of lipids chlorides; increase

antibacterial properties and barrier function of the skin, normalizes its reactivity. Segmental influenced of ultrasound changes the resistance of the skin to constant electric current (impedance), which is an objective criterion of neuroreflex action of ultrasound on the organism. The sensitivity to ultrasound of the various areas of the body skin is different. Thus, the more sensitive is the skin of the face, and then - of abdomen, much less sensitive is skin of the limbs.

The ultrasonic waves enhance physiological lability of the nerve centers and peripheral neuromuscular structures that helps to eliminate parabiogenic foci, increasing the adaptive-trophic function of the body. According to some researchers, despite the local impact of the ultrasound, in the formation of the body's reactions take part and the higher autonomic centers, hypothalamo-pituitary region, reticular formation and limbic system.

Small doses of ultrasound have a stimulating effect on the brain glia and alter energy metabolism in neurons. The reaction of the spinal cord neurons to ultrasound by electron microscopy data has a phase character, from the primary irritation to the restoration of the broken structures. Also is known the influence of ultrasound on the function of motor axons, that is increase conduction velocity along the peripheral nerves upon exposure to low intensity and pulse mode.

Ultrasound therapy activates and normalizes the function of the pituitary-adrenal axis, the sympathetic-adrenal system, thyroid and sex glands, normalizes exchange of catecholamines. Moreover, under the influence of ultrasound are activated not only trans-pituitary, but para-pituitary pathway of neuroendocrine regulation.

Ultrasound has a vasodilatory effect and normalizes vascular tone, improves the local blood circulation, microcirculation, increasing the circulation of blood and lymph flow, revealing the reserve capillaries, reducing their spasms and venous stasis. Ultrasound exposure increases the activity of mast cells, increases tolerance of plasma to heparin, and normalizes blood, increases tolerance of plasma to heparin, and normalizes blood, heparin, affects plasma cells of lymphoid tissue. Ultraphonotherapy slows blood clotting, mainly due to inhibition of the activity of the coagulation system. Deviations of coagulogram normalize after a course of ultrasonic irradiation (A.G. Mrochek et al., 1995).

Ultrasound therapy stimulates transcapillary metabolism in tissues, neovascularization, increases protein synthesis (V.S.Kotlyarov, 1991). As shown by experimental studies (T.A. Bozhko, 1993), the effect of small doses of ultrasound on the thyroid gland helps to correct stress disorders of myocardial contractile function. According to the authors, this is due to the increasing the permeability of cell membranes and passing histohematogenous barriers that contribute to a better capture of iodine by the thyroid gland and by thyroid hormone synthesis; increase its functional activity. A sufficient level of thyroid hormone is necessary for normal functioning of the myocardium.

Ultrasound therapy contributes to the normalization of respiratory function, increases the oxygen absorption by tissues; increasing the enzymatic activity of lysosomal enzymes of alveolocytes it leads to the purification of the inflammatory focus from the cellular debris, from the clots of fibrin and degradation products; stimulates the regeneration of alveolar tissue, removes spasm of the bronchi and pulmonary vessels. Ultrasound improves motoric, evacuative, absorptive functions of the stomach and intestines, relieves intestinal cramps, biliary tract, increases diuresis.

Ultrasound has a pronounced anti-inflammatory, analgesic, antispasmodic, fibrolytic, resolving, trophic, antipruritic, and anti-allergic effect. Under its influence the content of endogenous serotonin increases, which, apparently, has a protective effect in inflammatory, allergic and radioactive tissue lesions. However, the study on the influence of ultrasound on the inflammatory edema in the experiment showed that the ultrasound makes no significant action in case of acute inflammatory edema, exudation, does not decrease the inflammatory response of the cells (D.H. Goddard et al., 1983).

Under the influence of ultrasound the bioelectric activity of tissues improves, the phagocytic function of leukocytes increases, the mechanisms of nonspecific immunological reactivity are activated by increasing the histamine binding by protein of blood and splitting it by histaminase. When sonicating human blood leukocytes, it is revealed the positive effect of low intensity ultrasound on T-lymphocytes; changes in B-lymphocytes are not detected. Ultrasound has a bactericidal action primarily by damaging the cell walls of microorganisms. The sensitivity of different kinds of bacteria kinds varies; most sensitive are staphylococcus, viruses die under the influence of ultrasound.

Thus, the principle of the biological effect of ultrasound on the body is to enhance the activity and adaptive defense mechanisms. The therapeutic effect of this influence is expressed in anti-inflammatory, analgesic, antispasmodic, absorbable and desensitizing influence.

Ultrasonics enhances the throughskin penetration into the tissue and mucous membranes of liquid drugs and ointments (phonophoresis). This is especially true for low-frequency ultrasound, because its amplitude of oscillation is about two orders of magnitude higher than that of high-frequency ultrasound. In some cases ultrasound may be more effective form of thermotherapy than microwave radiation, paraffin baths or infrared radiation.

Ultrasonic vibrations are brought into sonicated zone through the contact medium (typically vaseline, apricot, lavender and others oil or drugs in the form of impregnated tampon).

All of the above allows to use the ultrasound therapy in a number of diseases.



## The methods and techniques of treatment with ultrasonic waves

The term «ultrasound treatment» (UST) involves the use of ultrasonic waves to act on the human body for therapeutic or prophylactic purposes. Experience of using the ultrasound therapy suggests the following options and its principles of application. Ultrasonic therapy most often is done directly on the area of pathological changes. For example, sonication of the psoriatic plaques, keloid scars or contact, sonication of one or more affected joints with arthritis. Likewise, ultrasound can affect the internal organs, placing the emitter on the region of liver, lungs, stomach, spleen, etc. This principle is widely used in UST; it is easily carried out and fairly effective. At the same time, as a rule, the long-term training for the use of this UST option is not required.

However, this principle of ultrasound therapy can not always be used. For example, how to influence the pathological focus in case of hypertension, neurosis and others.

In such cases, preference is given to ultrasonic therapy with the impact on reflex zones or acupuncture points (AT), that is, the sonopuncture, ultra-phono-puncture (UPP).

It should be noted that the most effective is the combination of two ultrasound therapy principles mentioned above, i.e. the impact on the pathological focus area should be united with UPP of the distal point. Thus, the professionals, involved in the practical application of UST, have a choice of four basic methodological approaches:

- a direct impact on the pathological center;
- the impact on reflex (segmental) zone;
- the impact on the acupuncture points in accordance with the basic principles and laws instead of the traditional acupuncture needle that is UPP;
- the effect on the pathological focus, combined with the impact on reflex (segmental) zones or acupuncture points.

It is naturally, that in each case doctor chooses the most appropriate methodological approach. However, if the impact on the pathological center at UST requires more technical training, then during UPP the basic knowledge of acupuncture, the rules to select the appropriate points, features of combination thereof are required in each case. The use of UPP allows to dose accurately the intensity of the impact on the acupuncture points, which is not easy to achieve by the classical method of chen-chiu therapy.

Currently there are three main options for ultrasonic treatment methodically identified: ultrasound therapy (including underwater), phonophoresis and ultrasound puncture.

For this option of impact is optimally to apply the mode with changing modulation frequency (1-10 or 10-100).

## Ultrasound therapy (UST)

There are two main methods of ultrasound exposure: fixed and labile. When we use a fixed technique the emitter is mounted motionless for all duration of the procedure. With labile method the emitter is slowly moved across the affected area with the speed of 1-2 cm per second, providing stroking movements – firstly – linear, then circular. During this technique it is sometimes useful to slightly delay (up to 30-45) in the most pronounced painful areas. In this case, the fixed-frequency modulation mode is better. In all cases, the contact of the vibrator (oscillator) with the skin should be maximized (at a right angle, perpendicular to the skin) in order to eliminate the air gap between the emitter and the skin. For this the exposure area is exposed, thick hair coat is removed and the skin is rubbed by copious amounts of contact substances (mineral oil or glycerin). Then the emitter is tightly applied to the skin. Especially the close contact is necessary to achieve near the bones, joints and rough surfaces of the body.

When need to influence on parts of the body of complex configuration the ultrasonic treatment should be provided through the rubber bag (glove), with water (the joints of the foot or hand). One of its surface takes the form of impact area, and the other is in contact with the transmitter. During underwater irradiation (irregularities, acute inflammation or ulcers, when touching lesions by vibrator is undesirable) emitter is held at a distance of 1-2 cm from the area of impact.

As already stressed, the ultrasound treatment is carried out by acting on the lesion, reflex zones or acupuncture points in a single procedure. Sonicated is the area of the body of the size up to 250 cm<sup>2</sup>. If necessary to act on larger surfaces, the area should be divided into several parts. On the first day we sonicate 1- 2 parts and then 3-4 parts. Sonication is carried out in pulsed mode at fixed frequencies using scanning frequency. The latter option is gentler, it is usually used in more severe stages of the disease, when pronounced are the neuro-vegetative manifestations of disease, when exposed on reflex-segmental zones, for children, etc.

Fixed pulse mode is advised in more severe inflammatory activity, moderately severe diseases of the cardiovascular system, sensitization and, where necessary to limit the thermal effect. The ultimate value of a therapeutic dose of ultrasound is the appearance of heat. There must be no feeling of strong burning sensation or pain, even when we work by the fixed method!

Currently, with the treatment purpose is prescribed small and medium-intensity ultrasound, rare - large. The maximum duration of treatment is 15 min. Sessions are carried out every day or every other day, a course of treatment include 6-14 procedures. Repeated treatment may be assigned in two or more months.

## Ultraphonophoresis (UPPh)

The ultra-phonophoresis of medications or just phonophoresis (the last name is out of the date, not exact, because there are no sound but ultrasound) - is a combination of physio and pharmacological treatment, in which the effects on the body is provided by ultrasound and medicinal substances entered with the help of it (V.V. Orzheshkovsky, 1998).

In medical practice this method takes a significant place. It involves the simultaneous combined effect of ultrasonic vibrations and the drugs on the body. To this end, sonication is performed through the contact medium in which the drugs are administered. The drug should retain its structure and biological activity, and its action is to be unidirectionally with ultrasound, ensuring their synergy effect on the organism. According to most researchers, UPPh acts through ducts of the sweat and sebaceous glands. A certain role in the penetration of drugs in UPPh play ion channels of the cell membrane and intercellular gap since one of the most important properties of ultrasound is its depolymerization and «loosening» effect.

Dosage of therapeutic impact is performed according to the energy flux density (intensity). Its threshold value at various techniques should not exceed  $1 \text{ W/cm}^2$  (5 microns). It should be remembered that the lower limit of the thermal action of ultrasound is  $0.8 \text{ W/cm}^2$  (4 microns) for pulse ultrasound fluctuations.

The duration of exposure on one field is usually 2-5 minutes, and on the area of a large joint – sometimes up to 6-10 minutes. Depending on the number of fields the duration of one procedure can be up to 10-15 minutes, in stable technique - to 3 minutes per zone, with labile – 5-10 min. Treatments are usually carried out every other day or every day. The average treatment course consists of 7-14 procedures. Because of the long and severe after-effect of treatment it is recommended to repeat the course no earlier than in 3-5 months. The X-rays therapy and radium therapy should be avoided for 3-4 months prior to treatment with ultrasound and 3-4 months after treatment.

Babies' ultrasound can be assigned in the preschool years. For persons under 20 years of age and older than 60 years, the intensity of the procedure is reduced by 30%.

As a prerequisite for the development of UPPh method was a significant increase in skin permeability and vascular cell membranes, increasing the number of functioning sweat and sebaceous glands, acceleration in transportation of substances; improving the functional activity of tissue under the influence of ultrasound.

Caused by ultrasound the increase of skin permeability and histohematogenous barriers create favorable conditions for the penetration the molecules of drugs through them. With this method the therapeutic effect of the ultrasonic waves are added to the therapeutic effects of a particular drug. Thanks to alternating pressure of ultrasonic waves the molecules of drug gain greater agility and reactivity. This significantly

increases the amount of drug entering the body and the efficiency of its therapeutic action. The UPPh effectiveness also depends on the area of its conducting.

The depth of drugs penetration at UPPh does not exceed the thickness of the skin epidermis. Proof of this is the fact that at the UPPh of radioactive isotopes in the subcutaneous tissue they are determined only in 1-2 hours after the procedure. Quantity of substance entering the body varies from 1 to 5% of the dose taken for the procedure. At the same time more substance enters through the mucose membrane than through the skin. For substances poorly soluble in water and also to enhance the absorption of drugs through the epidermal barrier, is used as the solvent of DMSO-dimethyl sulfoxide (25% solution). Be aware that the phoretic capacity of ultrasound (amount of medication entered into the body) depends on the frequency (at 22 kHz frequency greater than at 2640 kHz) ultrasonic intensity (with increasing up to 0.8 W/cm<sup>2</sup> (4 microns) increases, and then decreases), the mode (at continuous mode the amount of drug penetrating through the cell membrane is increased by 20%, comparing with exposure to the pulsed mode (U. Smolenski et al, 1988)). Also has the value the technique of the procedure (in labile technique more drug is entered), solution concentration (optimal is 5-10% of solutions), duration of the procedure and the place of entering (more drug enters through mucosal membrane than through the skin). Taking this into account, when introduced into the body phonophoresis from 1 to 5% of the procedures used for the drug, but its therapeutic efficacy is much higher than other options of administration.

UPPh of drugs have a potentiated effect of ultrasonic therapy and specific effect of the drug substance which is administered.

Ultrasonic vibrations significantly affect the pharmacokinetics and pharmacodynamics of «entered» drugs. As a result of the combined action there are a lot of potentiated therapeutic effects: vasodilator, anti-inflammatory and absorbable substances, antibiotics, immunosuppressants and anticoagulants and weaken their side effects. However, the ultrasonic vibrations can inactivate certain drugs (atropine, barbiturates, vitamins, codeine, caffeine, morphine, procaine, platifillin tartrate, polymyxin B sulfate, pyrazolone derivatives, quinine, ephedrine, etc.). Ultrasound waves do not substantially accelerate the diffusion of ascorbic acid and thiamine.

For UPPh are recommended such medications: hydrocortisone (5 g of hydrocortisone suspension is mixed with lanolin and vaseline, each 25 g), Pyramidonum (mixture of 5 ml 50% dipyrone solution with vaseline or lanolin, 25 g of each) or any other NSAID in a form of gel; Trilon B (Trilon B 5 g., petrolatum and lanolin, 25 g), antibiotics (ampicillin emulsion, monomycin, tetracycline); lidasa (64 units was dissolved in 0.8 ml of distilled water and add 0.8 ml of vaseline oil), aloe (liquid aloe extract 1:3 applied to the skin coated with vaseline oil layer), aminophylline (1.5 g aminophylline mixture, 20 g of distilled water, 15 g of petrolatum, lanolin, 15 g), prednisolone (0.5% ointment); Baralginum (2-2.5 ml of baralgin ampoule solution is rubbed into the skin and covered with glycerol), benzocaine (5-10% anesthetic

ointment), gangleron (a mixture of 0.25% gangleron solution with Vaseline and lanolin).

Penetrating into the human body, these drugs simultaneously with the biological effects of ultrasound increases the activity and adaptive defense mechanisms. The therapeutic effect of this influence is expressed in anti-inflammatory, analgesic, antispasmodic, absorbable, desensitizing influence.

Procedures are carried out in two ways: contact and distant (underwater). In the first case, on the target area medicinal substances in the form of solutions are applied, suspensions, ointments, and then is used fixedly mounted emitter (stable technique) or move it without departing from the skin surface (labile technique). When using the drug solutions they are pipetted and rubbed into the skin. Next, cover the place with vaseline oil and provide ultrasound influence. The effectiveness of this UPPh method increases after preliminary mechanical or chemical treatment of the skin surface in the area of exposure: dehydration by mixture of ether an alcohol, heating with hot water, or diadynamic electricity treatment (DT). In the second case the UPPh is conducted in the bath with the drug solution in degassed water at a temperature of 35-36° C. Emitter is moved by small circular motions at a distance of 1-2 cm from the skin surface. Such a method should preferably be used to influence the heterogeneous broad surface. In ophthalmology and dentistry various funnels and nozzles are used instead of baths.

*ATTENTION! When using liquid drugs, ultrasonic waves are supplied to the sonicated zone through the cotton-gauze tampon with thickness of 2-3 mm.*

By N.A. Gavrikov et al. (1975) was proposed ultra-phonophoresis of combined drugs with the provisional name «Kortan-1» (a mixture of 1% hydrocortisone solution and 10% dipyrone), «Biokortan» (a mixture of 0.5% hydrocortisone solution, 10% dipyrone and bio-stimulants such as drugs-gumizol, FIBS, pelloid of distillate), «Biofon» (preparations containing biostimulants «Biofon A» – aloe «Biofon G» - gumizol «Biofon P» - pelloid of distillate «Biofon F» - FIBS); «Pelan» (10 g dipyrone, dissolved in 40 ml of mud filtrate and mixed with a solution of 40 g anhydrous lanolin and vaseline 10 g).

Phonophoresis of drugs is combined with electrophoresis (ultra-phono-electrophoresis), diadynamic therapy (ultra-phono diadinamo-phoresis); amplipuls therapy (ultra-phono amplipuls-phoresis); magnetic (magneto-ultra-phono-phoresis); vacuum treatment (vacuum ultra-phono-phoresis); conducted on acupuncture points in the form of micro-ultra-phono-phoresis.

## **Sonopuncture (SP)**

The impact on biologically active points and the A-SHI (pain points) by means of ultrasonic vibrations has been called the ultrasound puncture. The basis of this

method is based on the same principles as in the general ultrasound therapy, the only difference is that the implementation of the therapeutic effect is not due to local effects, but due to the effect of acupuncture – acupuncture point - channel (meridian) - organ. In this regard, expanded is the range of indications for ultrasonic therapy, because in cases where the local ultrasound therapy is contraindicated, it becomes possible to conduct at remote locations from the lesion. In this case, the body is not exposed to intense ultrasound, and therapeutic effect is achieved by biologically active points (BAP). Note that the indications and contraindications for ultrasound puncture almost are the same as for physiopuncture.

Doctor who practices SP should have a clear idea what the ultrasound parameters he will use for the treatment of certain diseases.

For the doctor practicing SP it is optimal to have low-frequency ultrasound (44 kHz) for sedation effects. Preference should be given to low-frequency ultrasound when exposed to the signal, and, especially, on sympathetic points.

Here are energetic parameters of ultrasonic influence on biologically active points:

- A slight degree of ultrasonic stimulation (arousal, toning) corresponds to the intensity of 2-3 microns, with a duration of exposure of 5-20 seconds on one point, the modulation frequency of 1-10 Hz;

- Moderate stimulation (harmonization) corresponds to ultrasound intensity of the 3-4 microns, with exposure of 20-30 seconds at one point, the modulation frequency 18 and 37 Hz;

- High degree of stimulation (braking, sedation method) are respectively 4-5 microns and 30-60 seconds on one point, the modulation frequency of 75 Hz.

Particularly should be noted that the doctor, guided by the patient's feelings, must remember – the power of ultrasound stimulation of BAT should not exceed  $1 \text{ W/cm}^2$ . The total time for the ultrasound puncture is limited to 3-25 minutes. Procedures are conducted daily or every other day, a course of treatment usually consists of 7-14 sessions. It is necessary to rest for 30 minutes after the procedure.

Selecting areas for SP should be favored classical approaches, which are detailed in many studies (D.M. Tabeeva, 1980; G. Luvsan, 1989; I.Z. Samosyuk, V.P. Lysenyuk, 1994). It should be noted that the doctor conducting ultrasound punctures must clearly understand the functional significance of impacts, to be able to determine their location and use rules of selecting and BAP compatibility.

As with any medical process, an important task is the correct diagnosis of the disease, as well as the development of treatment strategies based on comorbidities. All this requires doctor's thorough and comprehensive examination of the patient, establishing the clinical and acupuncture diagnosis. In establishment of the last methods of electro-diagnostics by Nakatani or Voll can provide substantial assistance for the doctor. Selection of exposure points or their combination is a matter of creativity.

In recent years, the majority of acupuncture specialists used in formulating points both the traditional and modern principles. Among the modern principles the most popular and effective is segmental, in which influenced are metameres, having a common segmental innervation to the affected organ.

To these principles correspond the use of signal and sympathetic points, the action on which allows you to provide a therapeutic effect purposefully on specific organs.

Among other ways of selecting AP widely used is the method of effecting on pain points (A-SI), or a combination of local and remote pain AP on the meridian, which belong to these pain points. Treatment of pain syndromes can be carried out also by stimulating analgesic and signal points, as well as start and end points of the meridian. It is necessary to observe the following rules. In acute pain syndrome at first to act on points distant from the focus of lesion or on the opposite side of the point, then include the local points. In chronic pain syndrome or a long-term course of the disease treatment should begin with effecting (2-3 sessions) on the so-called AP of restorative action: P7 Le-Tsyue; GI4 Hae-Gu; GI11 Qu-Chi; E36 Tsu-San-Li; RP6 San-Yin- Jiao; R6 Chao-Hai; MS6 Nei-Guan; TR5 Wai-Guan; VG4 Min-men; VG14 Da-Chzhuy and auricular points AR55, AR82, AR22 and other \*, which can contribute to energy restoration and recovery of the patient.

In further treatment it is possible to make additional influence on the symptomatic points. With long-term course of the disease, along with the stimulation of tonic AP, it is necessary to use the special power of the energy of «seas», «pools» or «chakras».

For example, in diseases of the central nervous system (the effects of encephalitis, cerebral palsy, and others) recommended exposure to the AP of «medullary sea» -VG16, VG20, in the asthenic conditions or smoldering diseases the preference is given to «sea power» -E9, the V10. The points of «sea food» - E30, E36 are recommended to used in cases of chronic diseases of the gastrointestinal tract, the points named «sea of blood» - V17, E31, E39, with anemia. The treatment of diseases, which takes place on the background of reduced immune reactivity of the organism, should begin with the impact on the «ocean of energy» -VC17. Immunomodulatory effect is inherent in some of the other points, the influence on which has a beneficial therapeutic effect. Impact on AP of restorative action and energy «pools» in chronic diseases the first 2-3 sessions is the most essential because it provides the necessary «energy pattern» for further treatment.

The points of restorative action (Fig. 14), immunomodulatory (Fig. 15) and power pools constitute a basic recipe and it is desirable to include them (2-3 points) in each SP session.

The ultrasound therapy successfully use different AP: corporal (meridian points), out-meridian point and points of the ear.

Taking into account the experience gained by the use of acupuncture treatment

\* When exposed to auricular points is used only high-frequency ultrasound.

for chronic diseases, it is desirable to start with the use of distal points (restorative, immunomodulatory, energy seas, analgesic) and then reaching some improvement, it is necessary to switch to the impact on local points - the signaling points, sympathetic points and auricular points.

The number of treatment sessions in the course of ultrasound therapy are determined mainly by the clinical effect, but it remains important not to exceed the therapeutic dose, as the exacerbation of the process is possible. In chronic diseases usually prescribe repeated courses of treatment.

The doctor who uses ultrasound therapy is obliged to pay attention to the following points:

1) During the treatment session the patient, if possible, should lie, that reduces the probability of occurrence of adverse reactions.

2) At the first session, the doctor is obliged to establish the patient's individual sensitivity to the therapeutic effects of ultrasound, that is, to establish the required dosage to evaluate the effect on the patient's state of health, blood pressure changes, heart rate and other objective indicators. Throughout the course of treatment monitoring of the patient is carried out, and in case of adverse reactions in the treatment, it is necessary to make adjustments, even the abolition of ultrasound therapy.

3) In the selection of the impact dosage should be taken into account the degree of weakening of the body, the type of nervous system of the patient, the degree of asthenia. For example, in the treatment of children, the elderly, debilitated patients, the radiation dose should be reduced by 30-50% of average dose for middle-aged persons. With the same purpose cutting the session duration, or use much smaller device modes. Otherwise, the treatment may be accompanied by undesirable effects: vertigo, nausea, changes in heart rate, a fall or rise in blood pressure, etc. In any case, for the more successful adaptation of the patient to the ultrasound therapy sessions, it is desirable to reduce the total exposure time by 20-30 % during the first sessions.

4) For the best effect it is necessary to alternate points throughout the course of treatment, as the permanent effect on the same points reduces the therapeutic effect due to the adaptation to the impact. It is necessary to take into account the state of the meridians from the perspective of «redundancy - insufficiency» (a history of clinical manifestations or controlled trials by technical means of acupuncture diagnostics).

5) When preparing the recipe of points it is necessary to consider the presence of concomitant diseases. For patients with labile mentality, prone to alarming suspiciousness the formulation should include the points with calming action (E36 Tsu-San-Li, MS6 Nei-Guan, C7 Shen-Men, etc.).

6) It is necessary to carefully define the localization of the points, because points with different assignments can be placed close to one another.

7) In order to achieve maximum clinical effect of the treatment session, it is desirable to establish the time of session taking into account the daily activity of the affected meridians.



8) Do not act by the ultrasound on spots, nevi, angiomas due to its biostimulatory effect.

Furthermore, during the work the doctor has to act according with the recommendations for the use of different operating modes of the apparatus, including parameters of the power, frequency of ultrasound, type of modulation, etc.

For the introduction of drugs into the BAP (micro ultra-phono-phoresis) on the working surface of the radiator is covered the ointment base drug, and then make contact to the projection of point on the skin. Duration of exposure to each point is not more than 1-2 minutes. In general, the recommendations for micro-ultra-phono-phoresis look the same as recommendations for sonopuncture.

### **A combination of other health factors with sonopuncture**

As mentioned above, the ultrasonic puncture successfully combined with the simultaneous action of a magnetic field and, if necessary, followed by EHF puncture at the same point.

For example, sciatica. In this disease the most painful points are: VB30, V36, V58. These points can be influenced by ultrasound and immediately, without a break to apply the EHF-puncture. The number of combinations of ultrasonic puncture with a variety of medical factors virtually unlimited. However, to obtain maximum efficiency it is necessary to adhere to the general principle of physiotherapy-reflexology, using several methods of influence, try to «separate them on different levels.» For example, for the treatment of peptic and 12 duodenal ulcer disease is selected ultrasonic puncture + magnet with exposure to back points (V21, V20), then at the same session can be influenced by the infrared laser on the abdominal organs (the projection of 12 duodenal bulb, gallbladder, epigastrium).

### **The combination of ultrasonic waves action with other physical factors**

Treatment with ultrasonic waves may be combined virtually with all types of electrotherapy, vacuum massage, balneotherapy. Effective are combination of: ultrasound therapy with laser therapy, magnetotherapy and EHF. Ultrasound in these cases advisable to apply first. It should be remembered that in the physiotherapy conditionally are distinguished between two methods of influence: combined and united. Combined physical therapy is considered to be a consistent (not at the same time) use of physical methods of treatment. Thus combinable physical methods can be applied in a single day, on different days (interlace method) or in the course of treatment when other methods alternate. The united effect is a combination of two or more medical procedures either simultaneously or sequentially (one after another)

on the same region. Increasing the effectiveness of two or more treatment methods may result from the effect of summation of acting in the same direction (on the same physiological system) methods or potentiating the action of one another.

The effect of combined and united physiotherapy based on the strengthening of the local reaction and on the principle of contrast therapy and mechanism of sensitization. Properly selected physiotherapy complex greatly increases the effectiveness of treatment, has an impact on basic and associated diseases, various physiological systems of the body and the disease process, summarizes the positive effects of physical factors acting synergistically or weakens their adverse effects, as well as prolong the period of physiotherapy course aftereffect.

**In one day are compatible following procedures:**

- General and local action in the treating of main disease (e.g., ultrasound, and then general bath or electrophoresis);
- General action regarding main disease and local action for the treatment of concomitant diseases (e.g., ultrasound in the region of the tonsils and gas bath);
- Two procedures of local action for one disease (e.g., ultrasound and EHF-therapy);
- Two local sessions, the effect of which subsequently increased by the first (e.g., phonophoresis and amplipulse);
- Permissible is the use of three local procedures in one day that do not cause a large load and fatigue of the patient (e.g., microwave therapy, ultrasound and then electrophoresis);
- In the same session is acceptable combination of three factors, for example the magnet inductors on the medulla zone and the corresponding segment of the spine, and UST on the projection of pathological organ).

## **Indications and contraindications for ultrasound therapy**

### ***The main indications for ultrasound therapy***

1. Diseases of the peripheral nervous system (radiculitis, neuritis, neuralgia, myalgia, peripheral nerve injury);
2. Diseases of the musculoskeletal system (degenerative-dystrophic and inflammatory diseases of joints and deforming spine osteoarthritis, low back pain, spondylosis, ankylosing spondylitis, rheumatoid arthritis, bursitis, psoriatic polyarthrititis, periarthrosis, epicondylitis, heel spurs, the effects of trauma and joint contractures, post-fracture bones, chronic tendovaginitis, Dupuytren's contracture and Ledderhose disease, meniscal lesion, sprains);
3. Internal diseases (chronic bronchitis, bronchial asthma, chronic pneumonia, initial forms of pneumoconiosis, peptic ulcer and 12 duodenal ulcer, chronic colitis,

chronic cholecystitis without the presence of stones, biliary dyskinesia, chronic pyelonephritis, chronic pancreatitis);

4. Gynecological diseases (subacute and chronic inflammatory diseases of the uterus, secondary infertility, mastitis, etc.);

5. Urological diseases (prostatitis, epididymitis, orchitis, and others.);

6. Surgical disease (sluggish granulating wounds, scars, adhesions, hydroadenitis, burns, chronic osteomyelitis, limb obliterating vascular disease);

7. Otolaryngological diseases (chronic tonsillitis, hypertrophic pharyngitis, subacute and chronic sinusitis, in the absence of pus in the sinuses, allergic rhinosinusopathy with moderate allergization, vasomotor rhinitis);

8. Dental diseases (periodontal disease, glossalgia, scar adhesions of cervical-facial region, arthritis and arthrosis of the temporo-mandibular joints, masticatory muscles contracture);

9. Eye diseases (age scars, opacification of the vitreous, the prevention of corneal transplant opacity, residual manifestations of hemorrhage in vitreous, retinitis pigmentosa, diabetic eye disease, and others.);

10. Skin diseases (atopic dermatitis, chronic recurrent urticaria, limited scleroderma, arthropathic form of psoriasis, pruritus);

11. Diabetes and its complications, a pulmonary tuberculosis\* with staunchly non-healing cavities.

### ***Main contraindications***

- acute infectious diseases;
- fevers of unspecified nature;
- expressed neurotic or personality disorders;
- circulatory (atherosclerotic and etc.) III-IV encephalopathy;
- coronary heart disease with angina of II-III FC or arrhythmia;
- aneurysm of the heart; hypertension stage III,
- circulatory failure of III degree;
- thrombophlebitis (the affected area);
- blood disease;
- bleeding tendency;
- pregnancy;
- pronounced depletion;
- systemic blood diseases.

The relative contraindications include: neoplasms (tumors) and mental diseases in the acute stage, syringomyelia.

\* Currently are being conducted researches on the use of low-frequency ultrasound therapy in the combined treatment (with antibiotic therapy) of newly diagnosed pulmonary tuberculosis.

## ***Prohibited areas for ultrasonic therapy***

### ***The Epiphysis of growing bones (Approximately up to 17 years of age)***

The use of ultrasound may be accompanied by the risk of damage to the bone growth zone. Since ultrasonic instruments of older types operate at low intensity (on display data do not match the actual number of attached energy), their use in most cases not result in damage to the growth zone. For this reason, many doctors do not agree with these contraindications. Modern devices are much more strong and effective, can, comparing with older ones, cause damage to the bone growth area, especially if the radiating head doesn't moves. Preventing this contraindication is the responsibility of the physician. It is easily to overcome by applying appropriate intensity of ultrasound (0.4 W/cm<sup>2</sup> or 3 micrometers) and applying the labile (but not stable!) technique.

### ***The sex gland in men (testicles) and female (ovaries)***

Small doses lead to temporary spermatozoal and ovogenic failure, but large doses to permanent.

### ***Eyes***

The use of ophthalmic ultrasound devices is allowed only in specialized centers.

### ***Consequences of laminectomy***

As a result of the operation on the spinal cord, it is not completely covered by bone bed after laminectomy, and the intense effect of ultrasound on the spinal cord can lead to transient or persistent paraparesis. Prevention: the impact on the post-operative area should only be conducted with labile technique and low-intensity ultrasound.

It is not recommended to work with ultrasound directly on the heart, brain, on the protruding bone surfaces (the patella, the neural spines of the vertebrae, etc.).

## ***Features of ultrasound therapy***

Many authors believe that ultrasound therapy is a good treatment for epicondyle disease. This can be taken if the ultrasound is performed only for the relevant muscles. Direct exposure to ultrasound of the painful space of bone can lead to increased pain and possibly a transition in the chronic phase of disease (the same effect as in many cases of the massive use of corticosteroids). Similarly, the direction of the ultrasound straight «on the spine» often gives rise of pain in the periosteum around the protrusions of spine.

In the acute phase of post-traumatic condition (up to 24-36 hours) the application of ultrasound to the area of torn traumatized tissue is contraindicated (could intensify edema and 'slow' bleeding). The same applies to the classical inflammation (swelling, erythema, local temperature rise).

Especially sensitive is nervous system – peripheral nerves located directly on the bone (interference) or just beneath the skin (near field).

If the intensity of the ultrasound is too high, the deceleration in the corresponding nerve conductivity can occur, and then followed it by (reversibly) the blocking of the

flow pulses. However, it can follow irreversible disintegration of axons (myelin sheath is retained). Prevention: use labile techniques and low-intensity ultrasound on nerve projection.

The ridges of bone just beneath the skin (ankle epicondyles, spinous processes, etc.) are also sensitive to ultrasound. In such cases, preference should be given to the method of underwater ultrasound therapy.

There are other negative effects, mainly caused by an overdosing: hypoglycemia, fatigue, anxiety, change in appetite, and others.

The resumption of bleeding. For example, in the treatment of the knee joint by sonication, resuming epistaxis may occur.

Prevention: the use of low-intensity ultrasound in a patient with «usual» bleeding. Do not perform the ultrasound therapy during menstruation.

### ***Nota bene for doctor and patient***

Do not allow patient to conduct ultrasound therapy by himself !

Ultrasound therapy is often asymptomatic, but in the treated area, may feel a mild fever or heat.

If the skin feels the intense heat, it indicates lack of the contact substance. Pain during the treatment session may indicate the overdose or lack of movement of the radiating head. Stop the procedure in case of overdose.

Therapy can be resumed at a lower intensity, usually after a one-day break.

After the first procedure a temporary worsening of the disease may occur.

Noticeable subjective or objective improvement occurs no later than after the third treatment session.

If improvement does not come (in the acute or under acute conditions) after five sessions, ultrasound therapy should not be continued.

If ultrasound is used to treat chronic processes or changes in the mechanical properties of tissue (such as Dupuytren's contracture or plantar aponeurosis associated with osteophytes calcaneus), the impressive results can occur only after a full (14-15 sessions) treatment course or even several courses of ultrasound therapy.

## **Magnetic-laser therapy**

Concomitant use of complex physical factors become one of the important directions in modern physio-therapy. MF combination with a low-energy laser radiation (LeLR) currently is widely used.

The LeLR impact on certain areas or human tissue, located in the permanent or pulsed magnetic field (MF) has been called magnetic-laser therapy (MLT). Such a treatment option, as follows from the name itself, provides for simultaneous action on a specific area of two physical factors: LeLR and MF, for which the laser effect is enhanced in the magnetic field of therapeutic intensities (20-40 mT) by increasing the

absorption of infrared (IR) radiation in the collinear arrangement of the molecular dipoles arising in MF. It seems appropriate to stop at the physical characteristics of these factors. For laser characterized by the following physical properties: monochromaticity, coherence, direction and polarization.

Monochromaticity is a radiation of electromagnetic waves (EMR) of a specific frequency or a specific wavelength. For example, for a helium-neon laser (HNR) characteristic is the radiation of wavelength 632 nm, for Halieu arsenide laser-890 nm, etc.

Coherence is the order phase distribution of the laser radiation in both time and space.

The concept of orientation characterizes the small divergence of LeLR, the concept of polarization – ordering and orientation of the vectors of the electric and magnetic fields of the light waves in a plane perpendicular to the light beam. These physical properties of LeLR determine features of its biological action, and the intensity of the latter also depends on the wavelength: the longer the wavelength, the smaller the energy of the photon.

The laser light infalling on the surface of the biological tissue is divided into three parts: reflected, absorbed and diffused.

The coefficients of reflection, absorption and scattering primarily depend on the laser wavelength. Thus, the penetration depth of ultraviolet LeLR ( $\lambda = 337$  nm) is a fraction of a millimeter of the skin. The penetration depth of infrared LeLR ( $\lambda = 890$  nm), without MF, is 40 mm, and with the impact on the irradiated tissue with MF, the penetration depth growth up to 45 mm.

Biological factors affecting the change of mentioned above coefficients are: skin pigmentation, nature of tissue damage, the degree of its blood supply, etc. Thus it is known that the reflection coefficient of the laser radiation of human skin varies from 20 to 43%, the absorption coefficient of 57 to 80%. A liver, kidney, heart, spleen, large intestine have the high absorption coefficients (75 to 90%).

The degree of absorption of laser radiation defines the effect of laser treatment and the duration of the subsequent processes of pathology. Here is manifested the fundamental law of photobiology, the essence of which is to ensure that the biological effect can only cause a light wavelength that is absorbed by the molecules or components of the cell membrane. In the near-infrared (IR) region the absorption of light quanta, probably is due to overtones of oscillations of valence bonds of hydrogen atom with carbon, nitrogen and oxygen atoms, and the increase in vibrational energy of the biomolecules. This may explain the uniformity of the electromagnetic radiation in a wide wavelength range. Infrared light is preferentially absorbed in the body by water and oxygen molecules, and by some enzymes.

The main physical processes occurring in the skin, mucosa and other tissues at the absorption of light energy are reduced to appearance of internal photoelectric effect and electrolytic dissociation of molecules and different systems of the body.

During an internal photoelectric effect under the influence of laser radiation electron is first associated with the atom absorbs a photon energy, breaks the connection with the nucleus of an atom and becomes free. Therefore, by irradiating laser light to the tissue it increases the concentration of free electrons and the conductivity rises.

At the surface of the tissue more photons are absorbed and more free electrons are produced than in the depth of the tissue, and this leads to the occurrence of a potential difference between them, which in turn leads to a photoelectromotive force (PEMF) and the appearance of photons. Moreover, the larger power of the radiation is, the more pronounced is the effect. Increasing the concentration of free charge carriers – electrons – indirectly changes the dielectric constant (photodielectric effect), the magnetic susceptibility of tissue, etc.

Another result of the LeLR impact is weakening of ionic bonds and ion-dipole interactions in molecules and tissues due to the absorbed energy. Thus, free ions appear and electrolytic dissociation occurs. It is also known that the laser radiation in the wavelength range of 0,85-1,3 microns is absorbed primarily by oxygen, water, biological structures (primarily cell membranes) in resonance mechanism. This endogenous oxygen is virtually the only molecular target for MLT. This leads to the formation of two forms of high-energy singlet oxygen, the energy of which is realized in the form of non-selective photodynamic effect without photosensitizers. With regard to the laser therapy problems, the generation of singlet oxygen will result primarily to effects on cellular membranes, alteration of the antigenic properties of organs and tissues, as well as the peroxidation of cyclic compounds (purine and pyrimidine bases, cholesterol, steroids and hormones, bile pigments, porphyrins and others.) and aliphatic compounds (unsaturated fatty acids, phospholipids, sphingomyelin, cerebroside).

Consequently, the severity of the LeLR impact (gain or attenuation of the normalization of lipid peroxidation) depends on the concentration of singlet oxygen, that is, the dose of laser irradiation (V.A.Buylin et al., 1990)\*.

When using the combined (simultaneously) LeLR impact and MF, in addition to a simple summation of the energies there are also other physical phenomena. The first is the effect of Kikoin-Noskov: irradiation of tissue in the MF leads to the anomalous Zeeman effect and electron paramagnetic resonance, that is observed selective absorption of EMR by irradiated substance, associated with its transitions between Zeeman atomic electron energy levels. The frequency of the absorbed radiation (the resonance frequency) depends on the strength of magnetic field.

The laser pulse energy are utilizing, after it is some accumulation in the «dark stage» during the pulsed bio-stimulation (ie, in the intervals between laser pulses) only

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\* Buylin V.A., Polonsky A.K., Antonov G.A. et al. The use of magnet-infrared laser therapy device with a built-in photorecorder (MILTA-F) in medical practice. - M., 1998.- 102 p.

in high-speed and spectrally selective excitation transfer acts, cascades of biochemical reactions of the catalytic type, labile electronic states of the molecules in the cells of tissues and physiological substrates in the patient. Laser pulses can periodically renew, start (trigger principle) and «feed» the energy of such reactions in the case of local energy imbalance in certain diseases.

Thus, knowing the frequency of the laser light (the value reciprocal to emission wavelength) and changing the MF force is possible to achieve equality of the resonant frequencies of electron paramagnetic resonance and laser radiation that leads to a sharp increase in the degree of absorption of the tissue which being irradiated, and consequently, an increase in photocurrent and effectiveness of the procedure.

The increase leads to a photocurrent due to the Hall effect, an additional potential difference between the irradiated layers located at different depths of tissue, which in turn leads to an increase in photo-electromotive force to several tens of volts (Kikoin-Noskov's effect). It is also shown that MLT actively affects membrane processes in cells and a state of ions in tissues.

It is known that under the influence of LeLR free ions are formed in tissues ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ , etc.), which increase metabolic processes through activation of membrane processes. For example, an ionic bond energy of NaCl is 97 kcal/mol, but at the dissociation in liquid media of cellular structures the connection is weakened and does not exceed 10 kcal/mol, which is fractions of electron volts. Laser photon energy in the red and near-infrared spectral ranges about 1.9 eV, and that is enough to disrupt a fairly weak electrolytic ties. However, parallel is the process of recombination of ions, which slows down metabolic reactions. Simultaneous exposure of MF and LeLR on biological tissues inhibits ion recombination process. It is the united effect that promotes the separation of free charged particles by induced EMF proportional to the magnitude of the magnetic field (the Hall effect). It should also be noted that the photon energy of the laser light in the focus of the magneto-laser influence is able to break the energy ties between the water molecules and charged particles. Ions of tissue when irradiated by LeLR in MF are being ordered, the dipoles are aligned along the power lines of MF.

If power lines are directed deeper into the irradiated tissue, the bulk of the ions and polarized molecules, also are ordered deep into the tissue, which increases the penetration depth of the radiation. During irradiation of LeLR in MF more energy is absorbed by each unit of tissue volume.

Naturally, the mechanism of biological action of laser radiation, especially in combination with magnetic field may not be limited to any one elementary event, it is determined not only by a set of bioenergetic structures of separate cell or tissue, but also by reactions of the organism as a whole.



## ***Therapeutic effects of magnetic laser therapy (MLT)***

Varied and complex influences LeLR has on the body and leads to a significant number of effects, the main manifestation of which are anti-inflammatory and analgesic effects, stimulation of reparative processes, the pathophysiological sequence of which may be the following:

### ***Anti-inflammatory action:***

#### ***Activation of superoxide dismutase and catalase:***

- Activation of microcirculation;
- Change the level of prostaglandins;
- Immun-modulating action.

#### ***Reduction of lipid peroxidation when properly selected LeLR dose:***

- Alignment of the osmotic pressure;
- Reducing the tissues puffiness.

#### ***Analgesic effect:***

- Activation of neurons metabolism;
- Increase the level of endorphins;
- Increase your sensitivity to pain.

#### ***Stimulation of reparative processes:***

- The accumulation of ATP;
- Stimulation of cell metabolism;
- Increased fibroblast proliferation;
- Protein and collagen synthesis.

It is assumed that the specificity of LeLR action depends on the radiation spectrum as specific wavelength absorbed by specific biological substrate (cells, molecules, and others.). For example, LeLR in the ultraviolet range is absorbed mainly by protein substrate (amino acids), and as a specific acceptor of emission (helium-neon laser) is the enzyme catalase, having a maximum absorption in the red range of the spectrum (628 nm), which practically coincides with the wavelength of HNL radiation.

Increasing the catalase activity within certain limits positively affect the antioxidant system. Under the influence of LeLR in the red range, there is also is activation of enzyme superoxide dismutase in the tissues, which, like catalase enzyme has maximum absorption in the red range of the spectrum. All this leads to the normalization of lipid peroxidation (LPO), however, in case of adequately selected doses of EMR.

At high power loads and insufficient supply of the body with natural antioxidants, may increase lipid peroxidation processes that are manifested by appearance of exacerbations of the disease to 7-9 sessions of laser therapy. It is assumed that the strengthening of the oxidation processes in tissues associated with the formation of active (singlet) form of oxygen, as the latter has an absorption band near 640 nm (HNL  $\lambda = 632$  nm), and thus is activated, that is its singlet form.

Under the influence of Red-radiation (R) are improved the processes of microcirculation, activation of collagen and fibrillogenesis with rapid epithelialization

of the wound defect. The mitotic activation processes can be increased due to the energy metabolism in the cells of the wound edge epithelium and under the influence of HNR.

In the near-infrared range the photon energy of LeLR varies in limits that allow to initiate the oscillatory processes in the molecules of the substance and activate electronic excitation of atoms.

Therefore, the mechanism of action of biological activity of IR-radiation is associated with photochemical transformations and a significant increase in the thermal vibrations of molecules of substances.

As a result of IR-radiation in MF tissues come in a more excited state in which metabolic processes are amplified. This contributes to the appearance of free forms substances, biologically active products of photolysis, pH-change of the medium. Changes the energy activity of cell membranes, conformational changes occur in the liquid-crystal structures, primarily intracellular water. Strengthening of turbulent processes in the flowing blood and lymph provides the more complete response to the plastic and energy components at the points of contact with the capillaries. These effects occur in the zones of irradiation, play a launcher role for the development of zones generalized reactions at the tissue, organ and system level and whole organism.

There comes the activation of the DNA-RNA-protein system, biosynthetic and redox processes in the main enzymatic systems. The Magnetic-laser treatment causes an increase in macroergs formation (ATP), the mitotic activity of the cells, oxygen absorption by tissues, lowers the threshold of receptor sensitivity, reduces the duration of inflammation, interstitial edema and tissue tension, improves blood flow, increases the amount of collateral, has immunomodulatory effects\*, activates transport of substances through the vascular wall. Thus, clinical observations and experimental studies show that the therapeutic effect of LeLR and the MF is more pronounced than in the separate or sequential use thereof. At the same time it was possible to reduce the impact of exposure on the pathological center, compared to the duration of exposure when using only one factor and treat more deep-seated lesions.

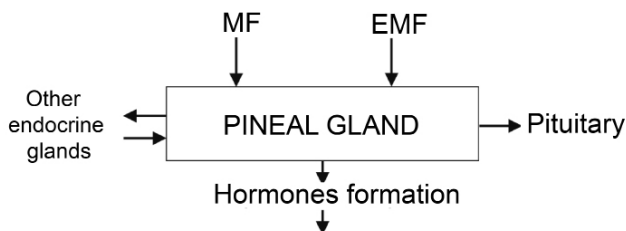
Furthermore, now it is shown that the Earth MF and the natural EMF actively affect many life processes, including endocrine glands, especially the pineal gland.

***The magnetic field of Earth and the natural electromagnetic fields affect:***

- the small groups of magnetite crystals which are inclusions in many cells of living organisms;

\* In 1980, the discovery of the team of scientists (B.B. Pershin, S.N. Kuzmin, V.A. Levando, R.S. Suzdalsky) have been registered, have proven that at the maximum physical and psycho-emotional stress separate classes of immunoglobulins from serum and human biological secrets completely disappear, protein molecules are responsible for the immunological reactivity of the organism. The normal concentration of immunoglobulins are recovered only in 2-4 weeks after cessation of stress factors. It is quite natural that people in times of stress significantly weakens the immune system. As a consequence, the risk of various diseases increases.

- system of acupuncture points, chakras and meridians;
- the paramagnetic properties of water;
- the endocrine glands and, especially, the pineal gland.



1) control of biological rhythms, primarily «day and night mode», and hence the sleep and wakefulness, normal sleep or insomnia;

2) control of human immune status and, consequently, disease resistance and possibly to cancer (these data are now intensively studied by scientists in many research centers);

3) control of human mood, that is, from the base function of the pineal gland, in particular on the level of its hormones depends largely the state of «depression», «euphoria» or balance. Interestingly that all antidepressants act directly «through the pineal gland» or indirectly affecting its function;

4) control of the sexual activity and functional status of the prostate. For example, it turned out that southerners who moved for living to the Nordic countries, very often suffered from prostatitis. The reason was the lack of solar light and, of course, from hypo functional condition of thyroid;

5) control of pain, that is, the dependence of human behavior from the pain that is his tolerance to the pain, on the function of the pineal gland and its hormones level.

Important experimental studies on the effect of the combined action of infrared radiation, the DC and AC magnetic fields in experimental atherosclerosis held S.M.Zubkova et al. (1998 \*, 2000 \*\*).

The experimental model of hyperlipidemia was created in rats by transferring them to diet without vitamin but rich in cholesterol (LDL) and Mercazolium. The object of the study were inbred male rats weighing 250-300 g and divided into the following series.

Control animals series was transferred, for the time of the experiment (24-28

\* Zubkova S.M., Varakina N.I., Mikhailik L.V., Bobkov A.S., Maksimov E.B. The combined effect of infrared radiation, the DC and AC magnetic fields in experimental atherosclerosis // Questions resort., Physiother. and Kin. Therapy-1998.-№ 4.- pp 31-36.

\*\*Zubkova S.M., Varakina N.I., Mikhailik L.V. et al. Restorative processes in the cerebral cortex, myocardium and thymus of rats with experimental atherosclerosis effects at exposure of low-frequency electromagnetic fields on the head // Questions resort., Physiother. and Kin. Therapy-2000.-№ 4.- S.3-7.

days), on the diet without vitamins, but without the cholesterol and merkazolium. Was isolated a series of rats with hyperlipidaemia who did not receive any influence of physical factors; II group of rats with hyperlipidaemia, that received IR radiation ( $\lambda = 0,87$  mm, 5 mW) of the cervical-thoracic spine (paravertebrally on CIV-ThV level) for 10 days for 3 minutes daily in combination with CMF (constans magnetic field) ( $30 \pm 10$  mT); III group of rats with hyperlipidaemia, the same zone were exposed to the infrared radiation in combination with a full-wave and alternating magnetic field (AMF) (50 Hz,  $30 \pm 10$  mT) for 3 min. daily for 10 days; IV group of rats with hyperlipidaemia, which at the same zone were exposed to the IR radiation in conjunction with CMF and AMF half-wave pulsed (50 Hz,  $15 \pm 10$  mT) 3 minutes a day for 10 days.

In all animals, authors studied the adaptive changes in target organs of this pathology (the myocardium, liver, cerebral cortex) in terms of protein and nucleic acid metabolism, the level of lipid peroxidation and antioxidant activity (AOA), indicators of activity of the kallikrein-kinin system (KKS) and protease inhibitors, the content of insulin and thyroid hormones in serum.

As a result of comparisons of all indicators investigated in experimental animals the authors concluded that the complex of physical factors (IR + CMF + half-wave pulsating AMF) turned out to be the best (of all three modes are used) to restore vasomotor metabolic and immune disorders arising in the development of atherosclerosis, as well as for proper authorization of inflammatory reactions on the intravascular level.

When the localization of effects was on the cervical-thoracic area (CIV-ThV), there was a decrease of the sympathetic nervous system tone in sympathetic ganglia and strengthening parasympathetic influences providing vasodilating action and change systemic and regional hemodynamics, with the active participation of kinin system.

In initiation of mutations, the authors point out, an important role as absorbers of IR-radiation, CMF and alternating magnetic field, play water molecules - of one of the most widespread connections of the body. For example, in the IR spectrum of water the region of 0.7-0.9 microns is characterized by maximum absorption and corresponds to the used IR range of 0.87 microns. It is the absorption of infrared radiation in the water molecule that creates the conditions for the interaction of radiation with biological membranes at the level of the near-membrane layer - glycocalyx, which is an integral component of the water molecule. Hydrated ions and cytoplasmic polyelectrolyte structures comprising water into their system, are also sensitive to IR-radiation systems.

In the CMF occur the orientation effects of the same water molecules hydrating the membranes or ions. The biological tissue is usually regarded as an optically turbid

\* The cyclotron frequency // Azbel M.Y. Physical encyclopedia. M., 1966.-T.5.-P. 397.

diameter or paramagnetic environment in which under the influence of CMF comes a certain ordering of the structure due to these orientation effects. And when on such an ordered structure to influence with infrared radiation, the scattering of light (Tyndall effect) is reduced and resulting biological effects are mostly related to the direct absorption of electromagnetic energy of infrared radiation.

If to these two factors (IR and CMF) would be added the third - AMF, the important role starts to play the frequency characteristics of this field. In essence, it is the frequency provides information towards the interaction electro-magnetic fields with biological systems, as it can help to inform the biosystem of adequate for her rhythm and synchronize its rhythmic characteristics. One of such type of frequency characteristics are the cyclotron frequency ( $\nu_{\sigma}$ ), which ions are determined by dividing the product of the ionic charge ( $q$ ) the value of CMF magnetic induction ( $B_0$ ), divided by the ion mass ( $m$ ) (M.Y. Azbel, 1966)\*:

$$\nu_{\sigma} = \frac{1}{2} \pi \cdot q \frac{B_0}{m}$$

At concurrence of the cyclotron frequencies or their multiplicity to the frequency of external alternating magnetic field, occur the resonance effects of these ions and the greater efficiency of its biological action is provided (A.R. Liboff, 1985<sup>1</sup>; A.R. Liboff et al, 1987<sup>2</sup>). It was found that such combination of CMF and AMF can change the intra- and extracellular calcium concentration and the conditioned reflex activity of mammalian (C.F. Blackman et al, 1985<sup>3</sup>; J.R. Thomas et al, 1986<sup>4</sup>).

Revealed by S.M. Zubkova et al. (1998), as well as in other studies (V.V. Novikov, M.N. Zhadin, 1994<sup>5</sup>; G.N. Ponomarenko et al, 1998<sup>6</sup>), increasing the biological activity of the combined effect of CMF and the AMF with a decrease in the alternating magnetic field induction is evidence of the critical importance of information exchange of AMF with biosystems.

Thus, by proper selection of the complex physical factors a more meaningful impact on the regulatory system of the body can be provided, reaching optimal adaptation reactions.

The results of experimental studies of S.M. Zubkova and co-workers (1998, 2000) were performed using the «MUM-50», which provided the possibility of simultaneous action of three factors mentioned above (laser light infrared, CMF and alternating

1 Liboff A.R. // Interaction Between Electromagnetic Fields and Cells.- New York, 1985.- P. 281.

2 Liboff A.R., Smith S.D., McLeod B.R. // Mechanistic Approaches to Interaction of Electric and Electromagnetic Fields with Living Systems.- New York, 1987.- P. 109.

3 Blackman C.F., Benane S.G., Hause D.E. // Bioelectromagnetics Society. Annual Meeting, 7-th: Abstracts.- San Fransisco, 1985.- P. 9.

4 Thomas J.R., Schrot J., Liboff A.R. // Bioelectromagnetics.- 1986.- Vol. 7.- P. 215.

5 Novikov V.V., M.N. Zhadin // Biofizika.-, 39, 1994.-, number 1.- pp. 45-49.

6 Ponomarenko G.N., Sokolov G.V. Shusov S.B. et al. Analysis of the clinical effects of ion-parametric magnetic therapy // Problems. Resort., physiother. and Kinesitherapy.- 1998.- № 1.- pp. 6-9.

magnetic field frequency of 50 Hz). The resulting high biological effect in the IV group of experiment a combination of these factors has no doubt. However, there are clinical studies (G.N. Ponomarenko et al., 1998; A.M. Gofeld et al., 1999)\* when with much smaller parameters of magnetic induction ( $\approx 70$  mT, which is comparable to Earth's magnetism) was received high therapeutic effect. Thus the basic parameters in choosing the impact are not their capacity, but the selection of the resonance frequencies.

To this end, by the scientific and methodological center «Medinteh» was developed a special unit for magnetic resonance therapy («MIT-MR»), it passed the technical and clinical trials with high therapeutic effect of many diseases (hypertension I-II, Angina, neuroses and etc.).

Technically, the device is made as a special mattress with 8 built-in inductors and the control unit. The tension of MF on the surface of the inductor is less than 2 mT, and in the zone of impact 50-200 mT. The device makes it possible to influence the following frequency variants: 1.2; 2.4; 3.3; 10.4; 12.5; 37.5; 50; 60; 75; 145; 700; 1500 Hz, which actually covers all the most commonly used frequencies (heart rate, an alpha rhythm, the frequency of physical blocking of ion channels, frequency and analgesic al.).

In addition to the machine are supplied one remote inductor imparted with the same parameters as the MF in the above, and outrigger MLT inductor with pulsed MF and IR-laser or a pulsed MF with the laser in the red range.

The procedure is as follows. After the required examination patient is placed «on the mattress,» that is the inductors in special packaging (mattress) and after setting the required parameters and enabling the timer, the button «start» is pressed and thus the procedure is carried, the duration of which is from 10 to 30 minutes.

If necessary, when there is a specific disease (liver, stomach, and other fractures), an external inductor or inductor-emitter which is connected to the control unit is applied to the desired organ.

Therefore, in medical practice the magnetic laser therapy has a significant place today, and its application in the foreseeable future is even more promising. The most famous models of the manufactured equipment are the devices of MIT series («MIT-1 MLT», «MIT-31», «MIT-1 Series 2», «MIT-1 IR» and others.).

## **General principles of magneto-laser therapy**

Magneto-laser therapy is currently used in two basic versions - zonal impact and transcutaneous laser irradiation of blood.

At the zonal exposure selection of targeted area is made according to the principles set out in the relevant section of our book, and the time and other parameters are determined firstly, the laser energy ( $J/cm^2$ ) and the tension of MF (mT).

It is known the following laser energy irradiation dosage effects (V.E.Illarionov,

1994; I.Z. Samosyuk et al., 1997):

- Preventive – 0.01-0.3 J/cm<sup>2</sup>;
- Biostimulating – 0.2-0.9 J/cm<sup>2</sup>;
- Therapeutic – 0.8-10 J/cm<sup>2</sup>;
- Inhibitory – 10-25-30 J/cm<sup>2</sup>;
- More than 30-40 J/cm<sup>2</sup> – damaging.

Based on the objectives of the treatment, the necessary dose is selected, and is calculated by the known formula:

$$t = E \cdot S / P \cdot K ,$$

Where t -exposure time, s; E - required dosage of exposure energy, J/cm<sup>2</sup>; S - exposure area, cm<sup>2</sup>; P - laser radiation power, W; K - factor of the use of radiation.

When carrying out zonal MLT frequently are used contacting, contact-compression or labile (scanning) methods and rare - remotely methods.

On the pathological focus, after, where appropriate, with all measures of asepsis and antisepsis (wound, trophic ulcer, an area of bone fracture, inflammatory infiltrate, etc.) act with the help of special devices such as MIT, which combined the magnetic field and laser radiation in emitters or impose a ring ferrite magnets (magnetic field strength of the order of 30-45 mT, but not more than 100 mT), and simultaneously irradiating by LeLR which with a power flux density of 4.5 to 20-30 mW/cm<sup>2</sup>, depending on the severity and nature of the flow of pathological process. Exposure of said above physical factors on one area, 3-10 min., in one session – 20 minutes. The treatment typically consists of 3-10 treatments, less frequently duration of 15 or 20 min. sometimes. With the lack of clinical efficacy after the first course of magnetic-laser therapy a second course of treatment should undertake in 10-15-20 days.

### ***Here are some options for MLT and features of their use***

L.N. Budkar et al. (1996)\* studied the effect of MLT in 112 patients with dysfunction of the pacemaker and conduction system of the heart (sinus node weakness syndrome or autonomic syndrome (parasympathetic) depressed sinus node and conduction system of the heart), which manifests itself in different variants of arrhythmias (ventricular or supraventricular arrhythmia).

\* Budkar L.N., Antyufev V.F., Oransky I.E., Bekhter T.V. Influence of the magnet-laser impact on clinical status and cardiac electrophysiological parameters in patients with cardiac arrhythmias // Problems. Resort., physiother. and Kinesiotherapy- 1996.- № 2.- P. 5-8.

\*\* Kochetkov A.V., Gorbunov E.F., Minenkov A.A. and other. Optimization of the early rehabilitation program of patients with cerebral stroke: the use of magnetic and laser techniques // Problems. Resort., physiother. and Kinesiotherapy- 2000.- № 3.- pp 17-21.

MLT course consisted of 15 daily treatments, which were carried out by the following procedure.

Exposure was carried out in the precordial area by infrared laser ( $\lambda = 0,8-0,88$  microns), the power density of  $4 \text{ mW/cm}^2$  and constant MF of 10-40 mT with total exposure of 12 minutes.

As a result, MLT marked a pronounced therapeutic effect in patients with sick sinus syndrome and less significant in patients with imbalance at VNS. However, the authors noted that a number of patients with arrhythmias experienced antiarrhythmic full effect, while others was got much facilitated in it.

Kochetkov A.V. et al. (2000)\*\* studied the effectiveness of various methods of magnetic and laser therapy in early rehabilitation of patients with cerebral stroke (CS) in 75 patients (57 people with ischemic CS, 18 with hemorrhagic CS).

Treatment was started at 4-5 weeks after the acute cerebrovascular accident (ACVA). In one group of patients (61 pers.) has been used the method of combined MLT (CMLT). Treatment procedure was as follows.

In the projection area of the lesion was performed the trans-cerebral impact by low-frequency alternating magnetic field (LFAMF) in a continuous mode, contactly, with cylindrical inductor (inductivity 27-35 mT), exposure of 10-15 min; a course of 15 treatments.

In 15-20 min. after applying LFAMF exposed the low-intensity infrared laser radiation (IRLILR) ( $\lambda = 0,89 \text{ mn}$ ) above the vessels. Parameters of IRLILR for one field: pulse mode (80-150 Hz), the power of 2-4 W/pulse with the contact stable method, exposure of 4-8 min. in the carotid sinus area and 4-10 minutes on a projection of the vertebral artery in the suboccipital region; the total exposure when using single-channel device, up to 20 minutes (4 fields); two-channel - 10 min.; a course of 12 treatments.

In patients with hemispheric lesions was used combined-united version of MLT (CUMLT). The essence of the method is as follows.

In one procedure, consistently, without interval the brain is influenced by LFAMF (1st field, see above.) And in the projection area of cervical enlargement of the spinal cord (2nd field): a rectangular inductor, contactly, intermittent (2-sec induce, 2 sec break), the inductivity of 18-25 mT, exposure of 10-12 min.; the total exposure to the two fields - 25 min.; on course 10-12 procedures. At the same time percutaneous laser therapy on the projection area of both common carotid arteries (CCA) was also carried out the impact on the joints (no more than 2 joints).

Parameters influence on field 1: pulse mode (80 Hz and 1.5 kHz for 2-4 minutes each), power up to 5 W/pulse, the exposure of 4-8 min.; method is contacting, labile; total exposure to 4-field up to 20 min.; the course consists of 10-12 procedures.

Patients in both groups received standard medical therapy.

As a result, the authors of the study noted: clinical and neurological efficiency of complex rehabilitation, including methodology CMLT, was 72% (in terms of



«significant improvement» and «improvement») and CMLT («improvement») - 85%, which is significantly higher than the control groups ( $P < 0.05$ ).

### ***Percutaneous magnetic laser irradiation of blood***

Until recently, the most common and good studied was the effect on the blood predominantly by red laser as intravenous, percutaneous or irradiation of transfused fluids and blood. These treatments are very popular among physicians and patients due to their relatively high efficiency. However, the practical application of magnetic laser therapy allowed to use it in order to blood exposure. Thus, from the very beginning it was a variant of percutaneous exposure with its possibility of deeper penetration at combination of these factors.

The advantage of magnetic laser hemotherapy before the laser is as follows.

1) For stable controlled positive results of hemo-laser-therapy is required the 1/3 the volume of circulating blood, and for enough effect of hemo-magnetic-laser-therapy - 1/4.

This is due to more intense influence of magnetic-laser exposure of blood. Red blood cells are known to contain iron which is paramagnetic and thus able to be «magnetized» and gain «new biological properties». The same applies to the enzyme «catalase» in the active center which also includes the iron atoms.

2) For laser irradiation of one third of blood volume, in the patient with a weight of 70 kg, for example via the cubital vein, it takes about 30 minutes. and in order to avoid a possible relapse during course of treatment, the optimal power of LR at the end of the optical fiber should be 1-2 mW.

The hemo-MLT procedure with equal effectiveness lasts 20-23 minutes with power of LR up to 20 mW and magnetic induction of 30 mT. At MLT procedures the phenomenon of the secondary aggravation of pathology usually is not observed. The latter, according to modern views, is associated with changes in the intensity of lipid peroxidation. In course application, for instance laser therapy, of especially considerable intensity (50 mW), and the long duration of the procedure (30 min.)

\* In very rare cases may develop vegetative-vascular reactions of two types: 1) a rise in blood pressure, headache, aching joints; 2) some fall in blood pressure, paleness of the skin, as an extreme option, «cold» and sweat chilling feeling, pretty significant weakness. Often it turns out that such reactions occur in these patients and with other procedures (e.g., when taking blood from a finger). The first variant is more common in 1-2 hours after the treatment and can last from several minutes up to 5-8 hours. In such cases, either rest or the corresponding application of antihypertensives, analgesics, tranquilizers are recommended. There is no danger of such states and it is not required to terminate the MLT. In the second variant mentioned manifestations occur in the first 3-5 minutes after the start of laser exposure. Therapeutic measures are the same as in other similar cases, i.e. ammonia, cardiac or vascular agents, a horizontal posture with raised extremities etc. In this case, a correction of doses is required and the MLT mode (reducing session time, output power, mode of action, the combination of operating factors) (V. Buylin et al., 1998).

after 6-7 treatments may experience an exacerbation of the disease. In physiotherapy and resort these facts are well known and described in the form of so-called «balneo-reaction». The possibility of exacerbation\* in most PT options related to the following factors:

- Depletion of natural antioxidants in the body in course of treatment;
- Increased metabolism and lipid peroxidation in response to «stress» (powerful) PT;
- Changes in hormonal status (activation of the prostaglandin system in its thromboxane link, dopaminergic department and others).
- In order to avoid exacerbation of the phenomenon it is recommended:
- The Intake of antioxidants for the for all period of PT (Vitamin E, A, C, Aevitum and others.);
- The short courses of treatment (up to 5 sessions) followed by a break for 3-4 days;
- Selection of adequate capacity (dose) of physical factors and the factors themselves.

It turned out that MT is a kind of natural antioxidant, which is due to increased absorption of vitamins of this group from the intestine under the influence of MFs and their activation in the blood, regulation of lipid peroxidation (known as MF parasympathycotony stimulation phenomenon), there may be other mechanisms.

Anyway MLT, unlike purely laser therapy, in most cases, does not cause secondary exacerbations which is extremely important in the treatment of many disorders (e.g., angina, post-infarction patients, hypertension etc.).

3) Percutaneous hemo-magnetic-laser-therapy allows to influence, due to significant penetration ability, not only on the blood venous system, but also on arterial and on the filled with blood ventricles and atria of the heart .

These advantages of percutaneous hemo-MLT gradually replacing laser techniques for blood exposure.

### ***The zone for exposure to magnetic percutaneous laser irradiation of the blood***

For this purpose are usually selected vascular bundles in areas where they are positioned most surfactantly: elbow and popliteal fossa, femoral and subclavian arteries, if necessary, the carotid arteries and the heart area. Less effect on smaller arteries or veins: radial, ulnar and others.

If the artery is influenced its pulsation is defined before the procedure and then magnetic-emitter mounted on the artery without much pressure (the blood must pass through the artery). Using a special fixing band (cuffs) transmitter is attached for the desired time. Next, turn on the device with the specified (required) parameters of magneto-laser impact.

## *Parameters of the procedure of hemo-magnetic-laser-therapy*

For hemo-magnet laser therapy (hemo-MLT) may be used both the red laser light ( $\lambda = 0,63$  micron), and the infrared ( $\lambda = 0,85-1$  micron). Preference is given to the latter. Red laser power range optimally should be of 10.5 mW and infrared of 10-20 mW. The magnetic-induction from 5 to 50 mT. With these parameters, the duration of exposure in a single session is 20-23 minutes. In case of other parameters the appropriate recalculation towards increase or decrease the duration of the procedure is required as well as at higher (70 kg) or less (70 kg) patient weight. However, the duration of hemo-MLT for adults should generally not be less than 15 min., and for children of 10 min. (the need for irradiation of a specific volume of blood). It should also be remembered that in one session is preferred to operate on 4 zones, by 5 min on each area than 20 minutes on one single zone (the bundle of vascular). In our work we prefer also a frequency modulation of these factors, determining in each patient of his basic rate by the number of heartbeats. For example, the number of heartbeats per minute is 75 beats, then  $75:60 = 1,25$  Hz. This is the base rate for a particular patient and the frequency of the modulation or a multiple of it is set on the apparatus.

Number of hemo-MLT procedures is defined individually and can range from 3 to 10-15 per course of treatment. If necessary hemo-MLT alternates or combined with other physiotherapy (ultrasonic, electro-therapy, etc.) and also with zonal exposure MLT.

B.S. Briskin et al. (1996) formulated the biophysical and biological effects of magneto-laser radiation as follows.

I. At the atomic and molecular level:

- The absorption of light by tissue photo-acceptor.
- Electrolytic dissociation of ions (the gap of weak links).
- The formation of electron excitation.
- The migration of electronic excitation energy.
- Primary photos-physical effect.
- The emergence of primary photoproducts.

II. At the cellular level:

- Changing the energetic activity of cell membranes.
- Activation of the cells nuclear unit, DNA-RNA-protein system.
- Activation of redox, biosynthetic processes and key enzyme systems.
- The increase in the cells mitotic activity, activation of the processes of reproduction.
- Stimulation of ATP and the nucleic acid synthesis.
- Reduced intensity of free-radical processes.
- Immunostimulatory effects.

III. On the organ level:

- Reduction of the receptor sensitivity.
- Reduction of the inflammation phases duration.
- Reduction of interstitial edema.
- Increased oxygen absorption by fabrics.
- Increased blood flow velocity.
- Increasing the number of new vascular collaterals.
- Activating the transport of substances through the vascular wall.
- Improve the microcirculation.
- Activation of metabolic processes.

IV. At the level of the whole organism:

- Anti-inflammatory.
- Analgesic.
- The regenerative, immunocorrective.
- Decongestants, desensitizing.
- Improvement of the regional circulation.
- Bactericidal and bacteriostatic effects.

## **The combined and united use of physical factors**

In the previous section we formed the basic principles of the exposure zone selection with multi-level rationale, systematic approach, as the most promising and giving the most significant therapeutic effect. In domestic PT to this date is justified and has been successfully applied an integrated approach to the appointment of therapeutic physical factors (TPF), providing combined or united their application. In our opinion, multilevel, systemic principle of zone selection is combined with complex application of TPF, complement each other and extend the capabilities of physiotherapy and physio-puncture treatment. In this regard, let us stop more detailed on these issues.

The combined use of TPF involves the simultaneous exposure to several factors in the same area carried out taking into account the laws of their mutual influence, which contributes to potentiation of the therapeutic effect. Clinical practice proved high efficiency and cost-effectiveness of simultaneous use of DC or pulse currents and mud applications (electro-mud), a high-frequency magnetic field and the drug electro-phoresis (inductive-thermo-electro-phoresis), vacuum-electro-phoresis and vacuum-magnetic therapy, electro-ultra-phono-phoresis and magnetic-phono-phoresis, magneto-laser-phoresis and ultra-magnetic-laser-phoresis and others.

Such variants of «phoresis» facilitate the administration of more drug quantity, increase pharmacological activity and extend its action in comparison with the individual application of electro-phoresis or ultra-phonophoresis.

The combined use of TPF requires consistent (at different times) use of TPF. In this case two or more impact factors can be carried out on one or different zones and

in different days or courses of the use of one method can be replaced by other course or procedure.

In recent years started regular serial production of devices that allow simultaneous use of magnetic field and laser radiation (magnetic-), ultrasound and laser radiation (laser-ultrasound therapy) - apparatus «MIT-31», as well as options for magneto-hydro-laser and magneto hydro-laser and vacuum therapy, hydro-bath, magnetic and others.

There is no doubt that further technical improvement of equipment will help to create new combinations of TPF.

The basic principles of a comprehensive physiotherapy are the principles of synergy and potentiation, implemented by inclusion of a set of physical factors of unidirectional action to the complex. For example, magnetic-, magneto-hydrodynamic laser-vacuum massage, laser, ultra-sound therapy and others.

The synergism principle is widely used in the combination of methods, for example, when the preliminary application of ultrasound, magnetic fields or magnetic-laser irradiation facilitates the introduction of larger amount of drugs by electrophoresis and prolonging their validity period. To enhance the analgesic effect of ultrasound therapy it is combined with diadinamo or amplipuls therapy, electro-phoresis of local anesthetic agents, while the increasing of anti-inflammatory and hiposensibilitic ultrasound effects are achieved through an integrated application of high-frequency electromagnetic fields, UHF, EHF, and UFO, low-frequency magnetic therapy or magnetic laser therapy.

Much less frequently is used the principle of antagonism in the complex physical therapy, which can reduce unwanted or excessive effect of the actions of one of the factors. In particular, the use of infrared rays (infrared hydro shower) to the area exposed to ultraviolet radiation causes of erythema attenuation. A similar procedure has already found application in a number of resorts in the Crimea.

The use of the electric UHF field or infrared laser radiation in combination with mud applications greatly reduces the acute reaction to the mud.

The principle of sensitization is sufficiently widely used in combining of TPF, based on the fact that the effect of one factor causes the body or some of its system to be in the state, more sensitive to the effects of another. Thus, prior to use techniques that cause active hyperemia (ULTRAFON therapy, heat treatments, massages) enhances the action of UV rays and gives possibility to carry out electrical stimulation more fully as a result of reducing the electrical resistance.

In the integrated physiotherapy nn importantis the principle of local gain (focal) reaction, which is implemented by a combination of methods advantageously general and local influence (local procedure usually precedes the general).

Accumulated to this date data make it possible to formulate the basic rules of the integrated use of therapeutic physical factors as follows (L.Y. Vasilyeva-Linetskaya, 1999):

1. There are no absolutely incompatible procedures in physiotherapy. Inappropriate use of individual actions on the exact same area on the same day does not exclude the possibility of their use in different areas or different days.

2. The effectiveness of the therapeutic complex is not enhanced by the inclusion of a large number of procedures, and depends on the doctor's ability to use multi-faceted properties of physiotherapy techniques for deliberate action on the pathological mechanisms of disease and sanogenesis, as well as the main clinical manifestations and comorbidities.

3. The most effective in most cases is the inclusion in the complex the procedures of general and local effect thus, it is reasonable to administer local effect immediately prior to the general, for amplification of locus reaction or 2-3 hours after the procedure, that cause the generalized reactions and requiring a period of rest and recovery.

4. On the same day it is advisable to appoint a single procedure of the overall impact, and only in patients with high adaptive properties of the cardiovascular system, being in remission, it is permissible to use two procedures of generalized influence providing enough (4-6 hours) period between them and maintaining the optimal number of procedures for the course.

5. Should act on a local area with one or two therapeutic factors, taking into account the possibility of their interaction and the optimal combination. With the presence of concomitant diseases the number of local effects may be increased to 3-4, carried on different zones, while it is advisable to use the methods which have different physical characteristics and nature, but do not have an antagonistic action with respect to each other.

6. Among the optimal combinations used for one zone and in one day, the therapeutic effectiveness of which has been proven, are a combination of MF and the laser radiation; electric field of UHF with FAL, electro-phoresis of drugs and ultrasound; high frequency electromagnetic fields, UHF, EHF with iontophoresis. Equally feasible is the combination inductothermy, UHF-therapy or micro-wave therapy with constant or variable pulse currents, and ultrasound. The effectiveness of the drug electro-phoresis increases significantly during the preceding exposure to infrared or visible rays or low-frequency magnetic field. Carrying out the electrical stimulation of neuromuscular system is more effective after thermal procedures, or, conversely, after cold exposures (after getting the hyperemia).

7. Of considerable importance is the sequence of actions and the interval between them. Thus, the use of ultrasound after iontophoretic administration of drugs are promotes more amounts of drugs into the tissue, an opposite order of procedures indicated deeper penetration of drugs. Optimal for iontophoresis after exposure to microwaves is no more than an hour interval between treatments, ultrasound should be used in 10-15 minutes immediately after exposure to DMV, but just before the magnetic-session.

8. The traditional rule says that it is not appropriate to combine in one day the

physical factors that are of similar nature. However, in recent years, thanks to the wide dissemination of short-pulse electroanalgesia apparatus for the relief of acute pain is widely used application in the same day of sinusoidal modulated diadynamic currents and short-pulse currents that are combined to affect one area 4-6 times a day. And besides, one or two procedures of diadynamic therapy (DDT) or CMT and all subsequent – by short-pulse currents. In order to provide the analgesic effect, the application of pulsed alternating sinusoidal current with frequency of 110 kHz (D'Arsonval current) and sinusoidal modulated currents are acceptable in one day on one area.

9. In most cases it is impractical to effect on one reflexogenic zone by two factors in one day except for using a combination of physical therapy techniques or special tasks.

10. As a rule, the procedures of diverse action are not provided in one day, in particular, heat and cold, due to possibility of the body adaptive systems overload and the development of pathological process exacerbation. This combination of procedures is justified only in certain cases, to provide training or quenching influence (contrast baths and showers) or to attenuate excessive reaction to a previous procedure.

11. On the day of complicated and tiring diagnostic investigations it is advisable not to prescribe physical therapy, especially of the overall impact.

To these recommendations should be added the following.

1. Combined or united use of TPF must take into account the multi-level, systemic principle in the choice of treatment zones. For example, in the treatment of optic nerve subatrophy optimal are proved:

- a) the magnet-laser influence on occipital lobe of the brain;
- b) magnet-laser influence on the eyes;
- c) the magnet-laser impact on cervical region;
- g) low-frequency ultrasonic impact on the liver area.

Along with this, preferable is the simultaneous influence by these factors on listed above zones. Carrying out such procedures is possible with the use of the machine «MIT-31».

2. For targeted and multilevel use of TPF must be a precise definition of the status of functional systems of the body using clinic data and acupuncture diagnostic methods (methods of Nakatani, Akabane, Voll et al.). In these cases, it is preferably to influence on the systems that are in state of hyperfunction by electromagnetic radiation of mm- range, and on systems that are in hypofunction - by laser radiation or ultrasonic waves.

3. With different combinations of TPF or their consistent application it is preferable to start with energetically more powerful influence, finishing with less powerful. For example, start with the impact of sonication, then - the laser and at the end of the procedure - EHF. This principle allows you to keep one side of the actions of all physical factors - informational. In the reverse order of the procedure (from weak

to strong) information of the poor is «erased» by the information of stronger.

Fig. 14 schematically shows the options for an integrated multi-level, systemic use of therapeutic physical factors.

Thus, the combined application of TPF, taking into account the multi-level systemic principle of zones selection is not equal to their cumulative effect, and represents new quantitative and qualitative effects, which can not only strengthen or weaken the effect of a single factor, but also give it new features.

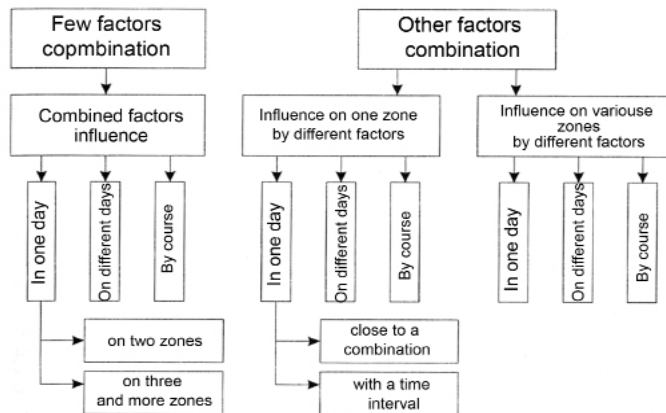


Fig. 14 Variants of complex multi-level systemic application of therapeutic physical factors



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# PRACTICAL RECOMMENDATIONS FOR MAGNET-LASER- ULTRASOUND THERAPY USE IN CLINICAL PRACTICE AND THE SPA

## (ON THE BASIS OF COMBINED APPARATUS FOR PHYSIOTHERAPY MIT-31)

### CONTRAINDICATIONS:

- Malignancy (malignancy);
- Thrombophlebitis;
- Ulcer bleeding (especially recurrent) in history;
- Hypertension stage II-III;
- Coronary heart disease with angina and arrhythmia;
- Individual sensitivity to the factor;
- Acute ischemic stroke;
- Pronounced hypotension;
- The presence of cardiac pacemakers.

Magnetic-laser-ultrasound therapy (MLUST) is effective in various diseases as it impacts on pathogenetic links common to diverse nature of disease. These common pathogenetic links refer to intracellular hypoxia, leading to a decrease in the body's energy potential (2 molecules of ATP are produced instead of 36-38, activated lipid peroxidation, impaired cellular metabolism, reduced functioning of the mitochondria, the membrane-damaged cell structure, adaptive reactions turn into pathological) (V. Buylin et al., 1998).

Designed MLUST techniques allow to influence on basic pathogenetic links of the disease and, that no less important, on the processes of sanogenesis.

1. The method allows to act simultaneously on three areas, the selection of which is carried out according to known principles of physical therapy, taking into account the outlined recommendations and experience of each individual physician.

However, the most important in selection of areas for MLUST is a multi-level systemic-principle that allows to «unite» the system disparate by pathological process.

2. It is necessary to take into account the physical characteristics of each factor, their overall impact on the body and a specific organ or area, the depth of penetration into the underlying tissues and other. Thus, with the inductor-emitter inducing MP and optical flow in the infrared range, should work on more deep-seated organs including ischemic foci in the brain and other. Inductor-emitter with the MP and

optical stream in a red range – at a superficial formations or tissues, including the neurovascular bundle and some reflex zones.

The impact of low-frequency ultrasound on a particular area or a projection of the internal organ is the most powerful of the applied, but it should take into account possible contraindications.

3. In each case, for each patient, in addition to the stimulated zones, should be selected the necessary exposure parameters: frequency modulation factors, their power, the duration of the procedure.

4. In order to achieve a stable therapeutic effect is carried out a course treatment, which comprises of 3-5 to 20-21 procedures.

In cases of alleged long-term treatment (10 treatments and more - chronic or recurrent disease) the energy capacity of used factors should be increased gradually.

5. Methods of MLUST should take into account the whole complex of medical actions in each case. Hence, strictly necessary are daily inspection of patients for timely registration of positive (or negative) changes in the condition of the patient, in consultation with experts. In acute diseases, treatment is carried out every day (sometimes 2 times a day) or every other day, in chronic – every other day or 2-3 sessions per week.

6. In some cases (for angina pectoris, postinfarction states, hypertension, stroke), when there is a threat of disease exacerbations (for 5-7-th session), the patient should be appointed antioxidants along with MLUST (Aevitum 600 mg/day or a multivitamin including vitamins C, E, A).

The procedures performed in lying position or reclining. The doctor determines the areas of the patient's body to be exposed to ultrasound and MLT. With significant amounts of the affected area it is divided into zones that would be irradiated in turn, bearing in mind that the total time of one procedure should not exceed 30 minutes for MLT and 15 minutes for UST.

Zones of influence, pulse repetition frequency and the power are define individually for each patient according to the disease and treatment method. After the procedure, the patient should rest for 30-35 minutes.

Magnetic-laser-ultrasound therapy should not be performed in the first 3 days of menstruation. For women it is advisable to start treatment after 5-7 days after menstruation.

## K00-K93 DISEASES OF THE DIGESTIVE SYSTEM

### K50-K52 NONINFECTIOUS ENTEROCOLITIS AND COLITIS

**Enterocolitis** - inflammatory-dystrophic disease of small and large intestine, leading to mucosal atrophy and intestinal problems.

#### **Etiopathogenesis**

The main etiological factors: infection, toxic effects, the abuse of certain drugs, radiation exposure, mechanical stress, genetic factors, etc. Leading pathogenetic mechanisms are intestinal dysbiosis, allergies (microbial, food, fabric), congenital and acquired enzymopathy.

To treat the infectious enterocolitis is possible to use magnetic-laser therapy only in combination with antibiotic therapy.

#### **TREATMENT SCHEME:**

Exposure is carried out before eating or 2 hours after a meal (alcohol and smoking are contraindicated, requires an appropriate diet).

5 minutes before the start of the procedure to drink 300 ml of liquid (phyto-solutions, mineral water, etc.).

On the forward panel of the device we expose the parameters:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	9,5 - gastric ulcer 8.6 - ulcer of 12- duodenal	UST - 10 in total MLT -5-7 in the zone, 25 in total

#### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 12-15.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Diet therapy;
- Drug therapy;
- Herbal medicine;
- Psychological correction.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on



the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

Day 1:

US - SP area (the projection of the stomach).

MLT Rd - Zone 8 (paravertebral, projection C8-D2 vertebral segments).

MLT IR - Zone 26 (paravertebral, D 10-12 segmental innervation area of the pancreas)

- Zone 26a (D 5-8 segmental innervation of the stomach area).

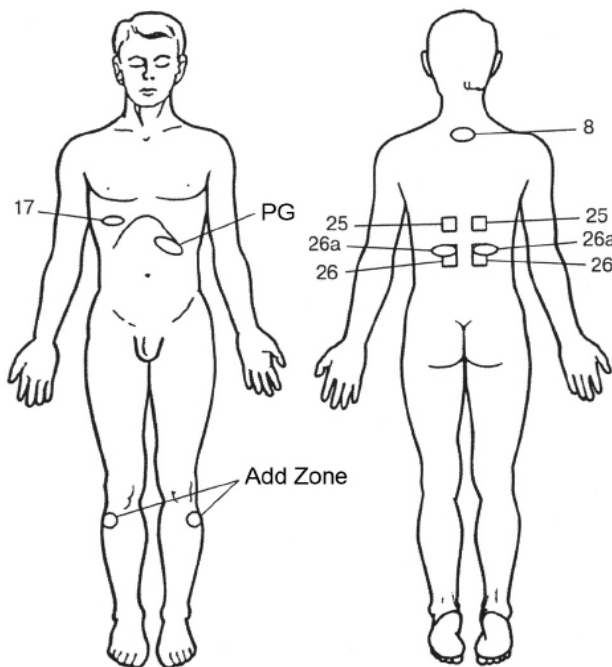
Day 2:

US - PL - Zone 17 (the projection of the liver).

MLT R - Zone 25 (the projection area D7-12 segmental innervation of the liver), D3 zone (additional area) AT 36.

MLT IR - Zone 17 (the projection of the liver), after the UST.

Influence zones		
US	MLT IR	MLT Rd
PS; 17	26,26a; 17	8; 25; Add Zone



## K29 GASTRITIS, DUODENITIS

**Gastritis** is an inflammatory disease of the mucous membrane of the stomach.

**Duodenitis** - an inflammatory disease of the mucous membrane of 12 duodenal ulcer.

### **Etiopathogenesis**

Gastroduodenitis is polyetiological disease.

Exogenous causes: H. pylori - a major factor; chemical (pesticide exposure); physical (receiving acute, cold or hot food); giardiasis.

Endogenous causes: increased acid production; reduce the formation of mucus; violation of the hormonal regulation of secretion; liver disease and biliary tract.

Pathogenesis of acute gastritis is possible to reduce dystrophic necrobiotic damage of glandular epithelium surface layer and gastric mucosa apparatus and development of the inflammatory processes. Depending on the etiology inflammatory process may be limited to the surface epithelium of the mucous membrane, or spread to the entire thickness of the glandular system, interstitial tissue and even muscle layer.

### **TREATMENT SCHEME:**

Exposure is carried out before a meal or 2 hours after a meal (alcohol and smoking are contraindicated, requires an appropriate diet).

5 minutes before the start of the procedure to drink 300 ml of liquid (phyto solutions, mineral water, etc.).

On the forward panel of the device are set the following parameters:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	50-75	9,4	Total: US up to 7 MLT – Not more 25.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 12-15.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Diet therapy;
- Drug therapy;
- Herbal medicine;
- Psychological correction.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with UST contactly. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

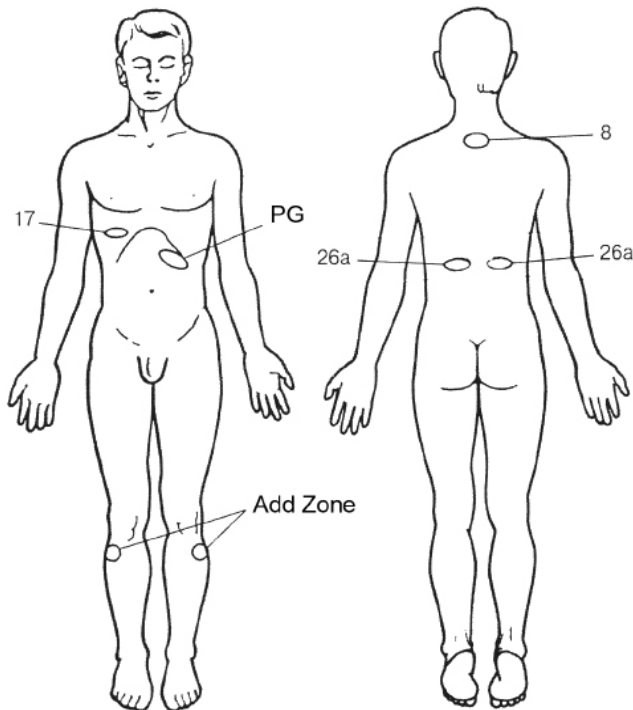
US - PS area (the projection of the stomach).

MLT Rd - Zone 8 (C8-D2 projection of the vertebral segments)

- D3 zone (the additional area, the epicenter of the AT 36).

MLT IR - 26a Zone (paravertebral, D 5-8 segmental innervation of the stomach area).

Influence zones		
US	MLT IR	MLT Rd
SP;	26a; 17	8; Add Zone



## K25 GASTRIC ULCER K26 DUODENAL ULCER

Peptic ulcer and 12 duodenal ulcer are chronic, prone to progression diseases characterized by the occurrence of ulcer in the gastric mucosa, and (or) 12 duodenal ulcer.

### **Etiopathogenesis**

The etiological structure of peptic ulcer:

- 1) hereditary constitutional factor;
- 2) exogenous factors (neuro-emotional stress, a violation of the daily regime and meals);
- 3) endogenous factors (nerve reflex action on the stomach and duodenum from the other affected organs, as well as cardiovascular, urinary and endocrine systems.

Emerging with pathological vissero-visceral reflexes violate the regulation of gastroduodenal, cause the discoordination of secretory and motor functions of the stomach and duodenum.

It is possible that a certain role in the pathogenesis of peptic ulcer disease plays a violation of blood circulation, as well as autoimmune reaction caused by infection H. Pylori.

### **TREATMENT SCHEME:**

Exposure is carried out before a meal or 2 hours after a meal (alcohol and smoking are contraindicated, requires an appropriate diet).

5 minutes before the start of the procedure to drink 300 ml of liquid (phyto solutions, mineral water, etc.).

On the forward panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	50-75	9,4	Total: US up to 7 MLT – not more 25.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Frequency of treatments: daily or every other day.

The number of procedures in the course of treatment up to 15.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Diet therapy in conjunction with psychophysiological correction;
- Drug therapy;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out contactly simultaneously with the UST. Inductors are mounted on the projection of the pathological focus, paravertebrally in the zone of innervation of organs, on the area of the reflex zones or zone of the medulla oblongata.

Day 1:

US - PS area (the projection of the stomach).

MLT Rd - Zone 8 (paravertebral projection C8-D3).

MLT IR - 26 zone (paravertebral, D10-D12 - segmental innervation area of the pancreas), 26a Zone (D5-D8 segmental innervation of the stomach area).

Day 2:

US - Zone 17 (the projection of the liver).

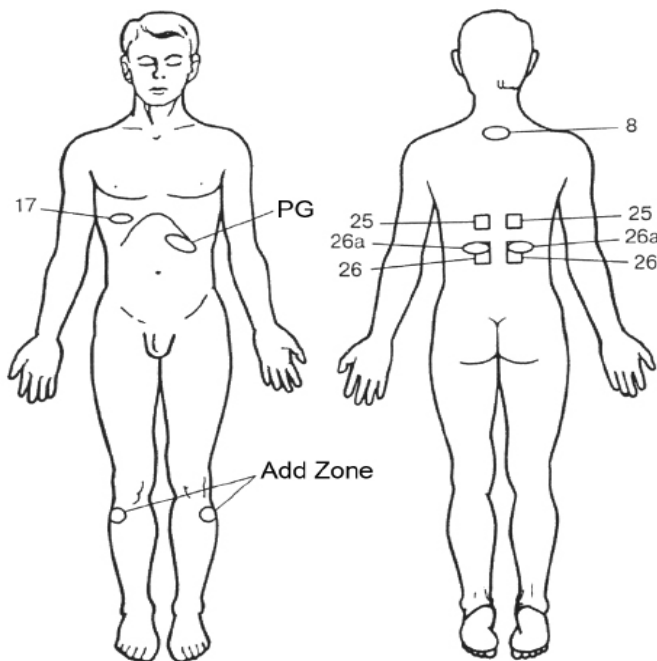
MLT Rd - 25 zone (projection D7-D12 zone segmental innervation of the liver)

D-3 zone (additional zone, the epicenter of the AT 36).

MLT IR - Zone 17 (the projection of the liver), after the UST.

MLT Blue - Zone 17 (the projection of the liver), after the UST.

Influence zones		
US	MLT IR	MLT Rd
SP; 17	26; 26a; 17	8; 25; Add Zone



## K71 LIVER TOXICITY

**Nonspecific reactive hepatitis** is a disease caused by exogenous poisoning acute or chronic liver disease aggravation.

### **Etiopathogenesis**

Toxic liver damage is caused by various pathological processes (inflammation, necrosis, degeneration, abnormal regeneration of the liver) due to exposure to toxic substances, as well as in excess of the dose of effecting substance.

The main groups of toxic agents: hepatotropic poisons, plant poisons, phenols, alcohols, etc., salts of heavy metals, poisons of biological origin (toxins), industrial and household chemicals...

Treatment is complex: MLT on the background of active detoxification (plasmaphoresis, dialysis, biological) and conventional therapy. Indications for the MLT are: hyperbilirubinemia in excess of 80 mmol/L; increase more than 5 times of the blood serum enzymes level: ACT and ALT. At lower below 80% rates of prothrombin and fibrinogen - below 1.8 g / l carrying out MLT is impractical.

### **TREATMENT SCHEME:**

The front panel of the device are set the following procedure parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
0	50-75	37; 50 alternate each other day	6 on one zone

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Methods of exposure: a stable, recommended zone.

This MLT R slow circular movements promoted by zones corresponding to the left and right lobes of the liver.

MLT IR - placed under the patient paravertebrally motionless (right and left for 3 minutes).

MLT Rd - Zone 17 (the projection of the liver).

MLT IR - Zone 25 (paravertebral, D7-L2 segmental innervation zone of the liver).

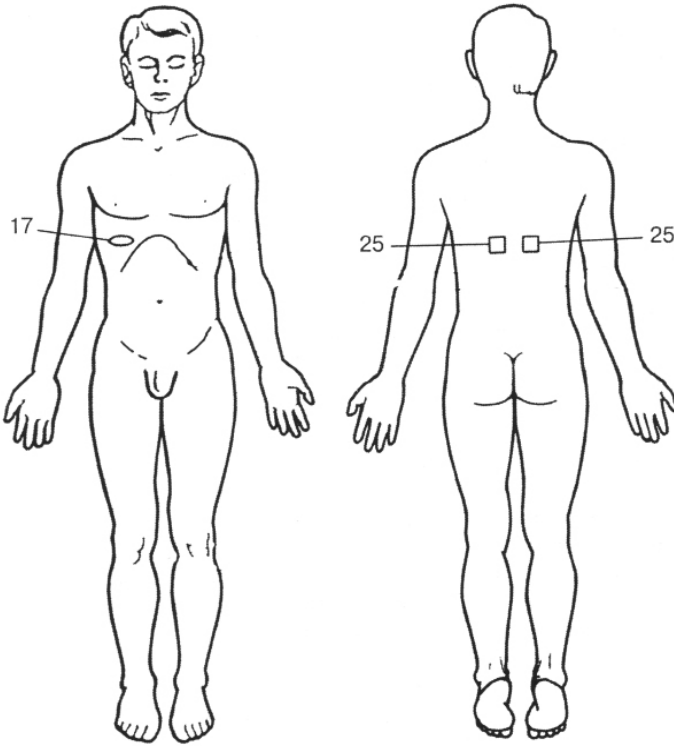
Frequency of treatments: daily.

Number of treatments: 6-12.

Possible combination with other treatments:

- Diet therapy;
- Drug therapy;
- Phytotherapy.

Influence zones		
US	MLT IR	MLT Rd
-	25	17



## K70 CHRONIC HEPATITIS

**Chronic hepatitis** is an inflammatory and degenerative nature liver disease.

### **Etiopathogenesis**

Proved is etiologic relationship of chronic viral hepatitis with acute viral hepatitis B, C, D, F and G. The development of chronic viral hepatitis is facilitated by such adverse factors as late hospitalization of patients with acute hepatitis, wrong treatment, premature statement, burdened premorbid background, and the presence of concomitant chronic diseases, use of alcohol, drugs, and superinfection by other hepatotropic viruses, such as delta virus infection with HBV.

The leading mechanism of liver injury in chronic viral hepatitis is the interaction between virus-containing immune cells with hepatocytes. Patients with chronic hepatitis noted the inadequacy of the immune response, resulting in antigen recognition process on the surface of hepatocytes and their elimination is disturbed and sometimes becomes impossible.

Treatment is complex: MLT on the background of active detoxification (plasmapheresis, dialysis, biological) and conventional therapy.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following procedure parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
0	50-75	37- 50 (1-3 sessions) 77 (4-10 sessions)	10 (3 on the zone)

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Frequency of treatments: daily.

Number of treatments: from 10-12.

Repeated course of treatment: 2-3 weeks.

Possible combination with other treatments:

- Diet therapy;
- Drug therapy;
- Herbal medicine;
- Laser reflexology.

Methods of exposure: stable at the recommended zone.

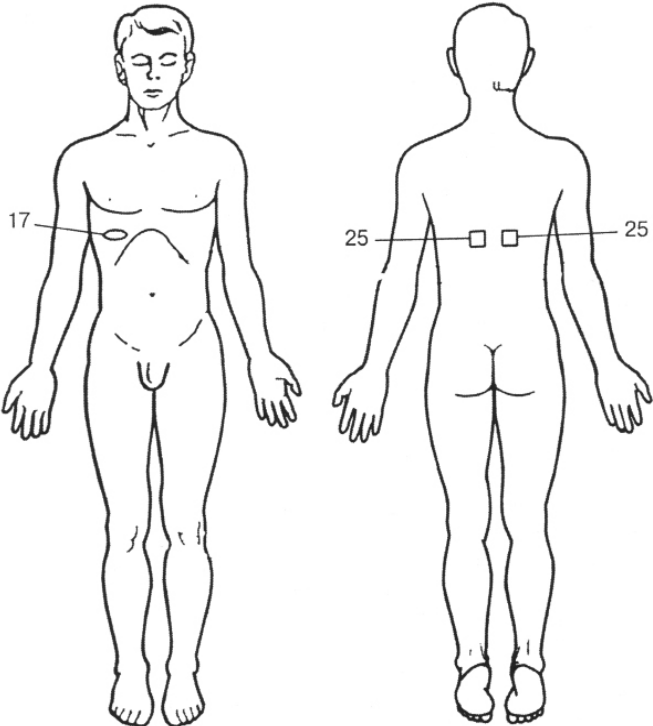
MLT IR slow circular movements move by zones corresponding to the left and right lobes of the liver.

MLT Rd - placed under the patient, paravertebrally, motionless (right and left for 3 minutes).



MLT Rd - Zone 25 (paravertebral, D7-L2 segmental innervation zone of the liver).  
MLT IR - Zone 17 (the projection of the liver).

Influence zones		
US	MLT IR	MLT Rd
-	17	25



## K82.8 DYSKINESIA OF CYSTIC DUCT OR GALLBLADDER

**Biliary dyskinesia** - biliary excretion system disorders characterized by a change in the tone of the gallbladder, bile ducts and sphincters, manifested by violation of the outflow of bile into the duodenum, accompanied by the appearance of pain in the right upper quadrant.

### **Etiopathogenesis**

The leading role in the development of dysfunctional disorders belongs to psycho-emotional overload, stressful situations. Secondary dysfunctional disorders more likely to occur when hormonal disorders: premenstrual tension, pregnancy, systemic diseases, hepatitis and cirrhosis of the liver, diabetes, inflammation, calculi in the gall bladder, etc. The decrease of the contractile function of the gallbladder may be due to a decrease in muscle mass and a decrease in sensitivity of receptor apparatus to neurohumoral stimulation.

### **TREATMENT SCHEME:**

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

Impact MLT carried out simultaneously with a contact UST. Inductors set (stable) on a projection of pathological hearth, or in para vertebral reflex zones and the zone of the medulla oblongata.

On the front panel of the device are set the following procedure parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
0	50-75	37- 50 (1-3 sessions) 77 (4-10 sessions)	10 (3 on one zone)

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: from 10-12.

Repeated treatment: if necessary, in a month.

Possible combination with other treatments:

- Diet therapy;
- Drug therapy;
- Herbal medicine;
- Ultrasound puncture.

Methods of exposure: a stable or labile on the recommended zone.

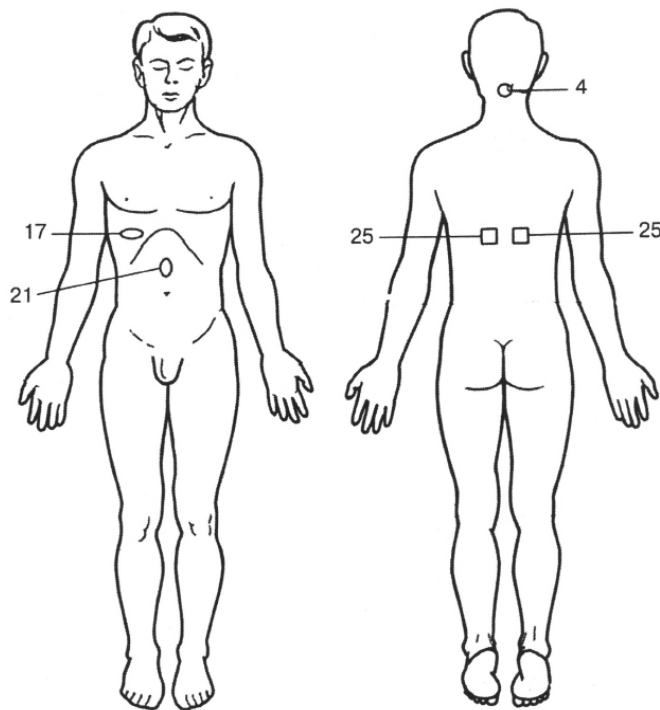
US - Zone 17 (right upper quadrant)

- Area 21 (epigastrium - epigastric pain point).

MLT Rd - Zone 4 (zone of the medulla oblongata).

MLT IR - Zone 25 (paravertebrally, D7-L2 segmental innervation zone of the liver).

Influence zones		
US	MLT IR	MLT Rd
17, 21	25	4



## K 86.0 CHRONIC PANCREATITIS

**Chronic pancreatitis** is a progressive inflammatory disease of the pancreas accompanied by severe violation of its functions.

### **Etiopathogenesis**

The most common causes of chronic pancreatitis are diseases of the stomach, duodenum, liver, gallbladder and biliary tract (hepatitis, cirrhosis, cholecystitis, cholangitis, duodenitis, peptic ulcer disease, particularly ulcer penetrating the pancreas). Chronic pancreatitis occurs in almost 30% of patients undergoing cholecystectomy. Among the reasons for it should be noted nutritional disorders and changes in fat metabolism (errors in diet, alcohol); intoxication, poisoning; changes in the ductal system of the pancreas (primary tumor, stricture, metaplasia of the epithelium of the excretory ducts); contusions pancreas; acute and chronic infections.

An important role in the pathogenesis of chronic pancreatitis plays intraorganic activation of enzymes (protease and lipase) damaging the tissue of the gland. Contributing factor for the development of chronic pancreatitis is stagnant secretions caused by a mechanical obstacle in its excretory ducts.

Pathogenesis. Chronic pancreatitis causes severe disorders of parietal digestion and absorption, disruption of proteins metabolism, fats and carbohydrates.

### **TREATMENT SCHEME:**

At all stages of the disease MLT procedures may be conducted, except when the emergency surgery is needed, including the gallbladder.

#### **ATTENTION!**

*The impact of ultrasound on the projection area of the pancreas is not recommended for pancreatitis!*

The front panel of the device exhibiting the following procedure parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
0	50-70	37- 50 77 (on pain zones)	MLT – 15

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Frequency of treatments: daily.

Number of treatments: from 10-12.

Repeated treatment: if necessary after 2 weeks.

Possible combination with other treatments:

- Diet therapy;

- Drug therapy;
- Phytotherapy.

Methods of exposure: stable on the recommended zone.

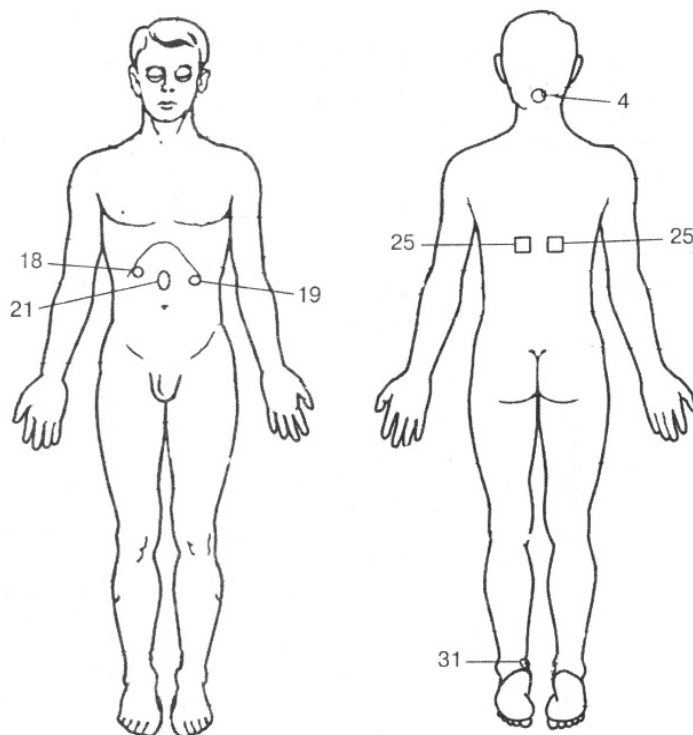
MLT inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

MLT Rd - Zone 4 (zone of the medulla oblongata)

- Area 37 (between the inner ankle and Achilles tendon attachment place of the left foot).

MLT IR - Zone 25 (paravertebrally, D10- D12 segmental innervation area of the pancreas).

Influence zones		
US	MLT IR	MLT Rd
-	18, 19, 21, 25	4, 31



## K81 CHOLECYSTITIS (non-calculous)

**Chronic cholecystitis** - chronic inflammation of the gallbladder, which occurs when the penetration of various microbes from 12 duodenal, as well as by blood and lymphatic vessels from different foci of infection in the body.

### Etiopathogenesis

Chronic non-calculose (without stones) cholecystitis - is a chronic inflammation of the gallbladder, usually combined with motor-tonic disorders biliary system, but is not accompanied by the formation of gallstones.

The reason of chronic non-calculose cholecystitis may be conditionally pathogenic microbial flora (Escherichia, streptococci, staphylococci, rarely Proteus, Pseudomonas aeruginosa, enterococci).

Predisposing conditions are the stagnation of bile in the bile ducts and gall stones, worms. Typical symptoms of cholecystitis are: paroxysmal pain in the right upper quadrant extending to the right scapula and the shoulder; yellowness; severity of epigastric bloating, nausea, belching.

### TREATMENT SCHEME:

On the front panel of the device are set the following procedure parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-4	50-70	2,6	US - 7; MLT - 10

### METHOD OF TREATMENT

Position of the patient - lying on his back / sitting.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 8-12.

Repeated treatment: if necessary after 2 weeks.

Possible combination with other treatments:

- Diet therapy;
- Drug therapy;
- Herbal medicine;
- Ultrasound puncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable)

on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

US - Zone 17 (the projection of the liver, right upper quadrant)

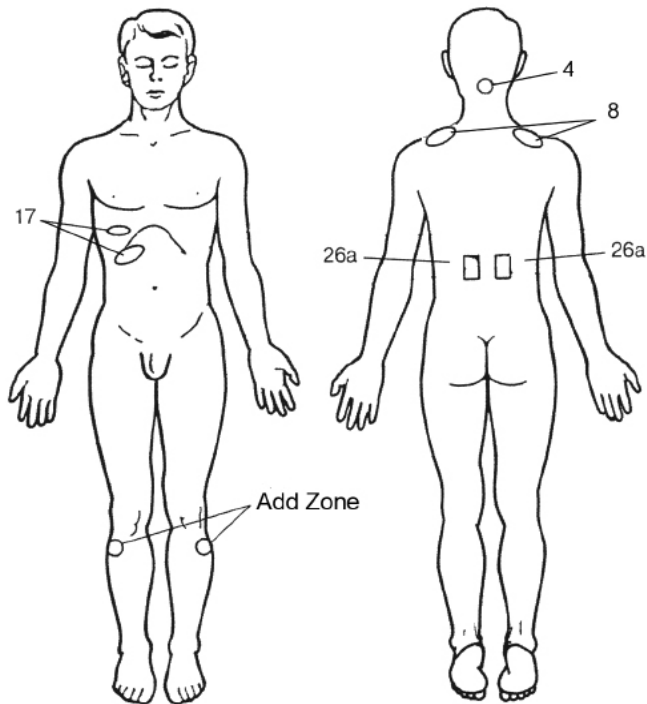
- Zone 8 (shoulder girdle).

MLT Rd - Zone 4 (zone of the medulla oblongata)

- Add Zone (the additional area, the acupuncture point E36).

MLT IR - 26a Zone (paravertebrally, D7- L2 segmental innervation area of the gall bladder).

Influence zones		
US	MLT IR	MLT Rd
17, 8	26a	4, Add Zone



## K 59.0 CONSTIPATION (OTHER FUNCTIONAL INTESTINAL DISORDERS)

**Constipation** is a violation of bowel function, resulting in an increase intervals between acts of defecation in comparison with the individual norm or systematically inadequate bowel movement.

### Etiopathogenesis

Constipation is caused by violation of the processes of formation and promotion of stool through the intestines. The main causes are intestinal motility disorders, weakening of the urge to defecate, changes in anorectal and pelvic floor. Anamnestic moments must also be considered as etiopathogenic factors: in childhood - lack of training health defecation, resulting in growing fear of defecation; into adulthood - an increased level of anxiety, the presence of stress factors.

### TREATMENT SCHEME:

On the front panel of the device are set the following procedure parameters::

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-4	75-99	3,8; 7,8; 65	US -5-7 MLT - 10

### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: every other day.

Number of treatments: 10.

Repeated treatment: if necessary, in a month.

Possible combination with other treatments:

Maximum efficiency is achieved by pre and post acupuncture, balneotherapy as well.

- Diet therapy;
- Drug therapy;
- Herbal medicine;
- Ultrasound puncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable)



on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

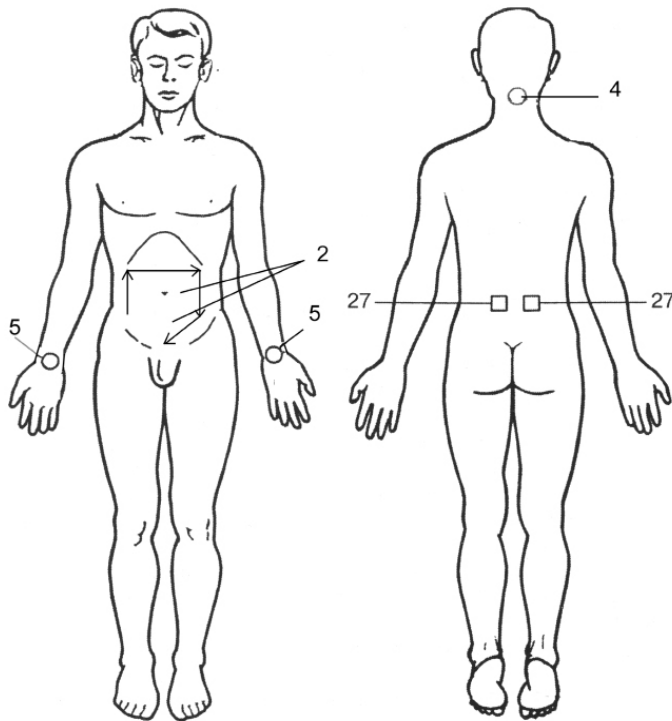
US - Zone 2 (in the direction of the colon).

MLT Rd - Zone 4 (zone of the medulla oblongata)

- Zone 5 (wrist crease on the right / left).

MLT IR - Zone 27 (paravertebrally, D8- L1 band segmental innervation of the colon).

Influence zones		
US	MLT IR	MLT Rd
2	27	4, 5



## J00-J99 RESPIRATORY DISEASES

### A15-A19 PULMONARY TUBERCULOSIS

**TB** - an infectious disease characterized by the formation in the affected tissue specific inflammation foci and expressed the general reaction of the organism. Pathogen - mycobacterium tuberculosis. The main source of infection - the sick people.

#### **Etiopathogenesis**

The causative agent of tuberculosis is the tubercle bacillus or Mycobacterium tuberculosis. Its activity retains for a long time on the objects (clothing, utensils, etc.), resistant to acids and many disinfectants. The main source of infection is a sick person or a sick animal. The main route of infection - airborne.

#### **TREATMENT SCHEME:**

On the front panel of the device are set the following procedure parameters::

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	9,4	US -12; MLT - up to 15

#### **METHOD OF TREATMENT**

Position of the patient - lying on his stomach with UST of paravertebral zones; lying on his back at UST of caverns.

Position of transmitter: contact.

Frequency of treatments: 1-2 days.

Number of treatments: 15.

Repeated treatment: spend 1-3 rate intermittently 1.5-2 months.

Possible combination with other treatments:

- Specific anti-TB therapy;
- Drug therapy;
- Phytotherapy.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors set (stable) on a projection of pathological hearth, or in paravertebral reflex zones and the zone of the medulla oblongata.

US - Zone 23 (paravertebrally, D2 - D5 segmental innervation of the lung area)

- Area 16 (the projection of possible tuberculosis foci).

MLT R - Zone 15 (the projection of the thymus gland)

- Area 12 (subclavian fossa)

- Area 11 (ulnar fovea)

- Area 20 (the projection of the spleen)

- Area 10 (palmar surface of hands).

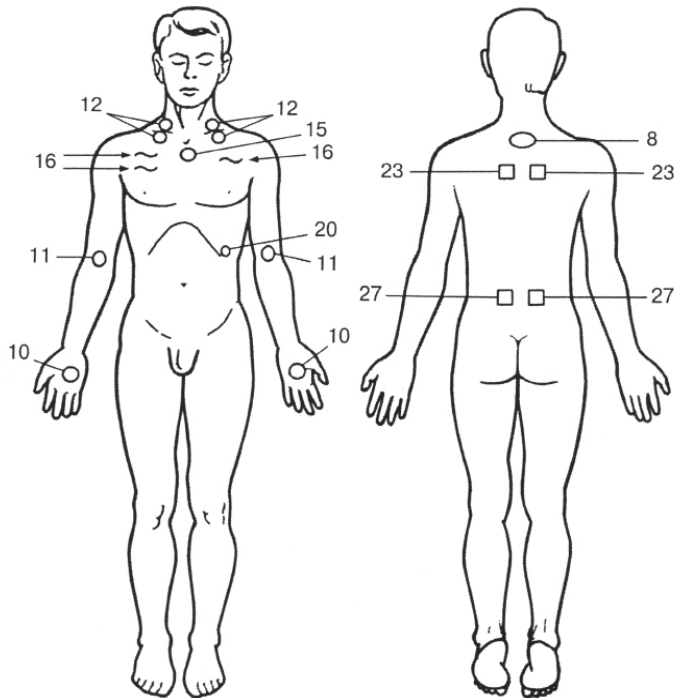
MLT IR - Zone 8 (projection C7 vertebrae segments - D2),

- Area 27 (paravertebrally, D11 - L1 segmental innervation zone of the kidney and adrenal gland).

**ATTENTION!**

*Usually in one single session are influenced 3-4 zones; 1-2 zones for the impact of US and 1-2 zones for the impact of MLT.*

Influence zones		
US	MLT IR	MLT Rd
16, 23	27; 8	15; 12; 20; 11; 10.



## J42 CHRONIC BRONCHITIS UNSPECIFIED

**Chronic bronchitis, (CB)** is a long, usually progressive inflammation of the bronchial tree, manifested by cough, sputum, shortness of breath.

### **Etiopathogenesis**

The etiology of chronic bronchitis essential is the long-term effect by infectious agents (viruses influenza, adenovirus, Mycoplasma, Pneumococcus, pollutants (volatiles) - tobacco smoke, exhaust and of non-indifferent dust, which provide mechanical and chemical effects on the bronchi and bronchial mucosa. In the pathogenesis of CB matter the secretory disorders of protective function of bronchi, and mucociliary clearance (bronchi purification) arising under the influence of pollutants.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following procedure parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	9.4 obstructive bronchitis 8.0 bronchitis wheeze	US -12; MLT - up to15

### **METHOD OF TREATMENT**

Position of the patient - lying.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 10-12.

Repeated treatment: 1-3 courses with 1.5-2 months breaks.

Possible combination with other treatments:

- Drug therapy;
- EHF-puncture; electrophoresis of 0.1% solution of Lysozyme bilaterally.
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

### **ATTENTION!**

*Thorax divided into six fields: the right and left front, right and left rear and 2 side.*

*Usually two fields are used for one session for the impact of UST (excluding the region of the sternum and the heart) and 2 zones for the impact of MLT.*

1 Day

UST - Zone 1 (the right and left field in front of the chest).

MLT Rd - Zone 4 (zone of the medulla oblongata).

MLT IR - Zone 23 (paravertebrally, D3 - D6 area segmental innervation of the bronchi).

2nd day

UST - Zone 2 (the right and left field back of the chest).

MLT Rd - Zone 15 (the projection of the thymus gland).

IRL - Zone 4 (zone of the medulla oblongata).

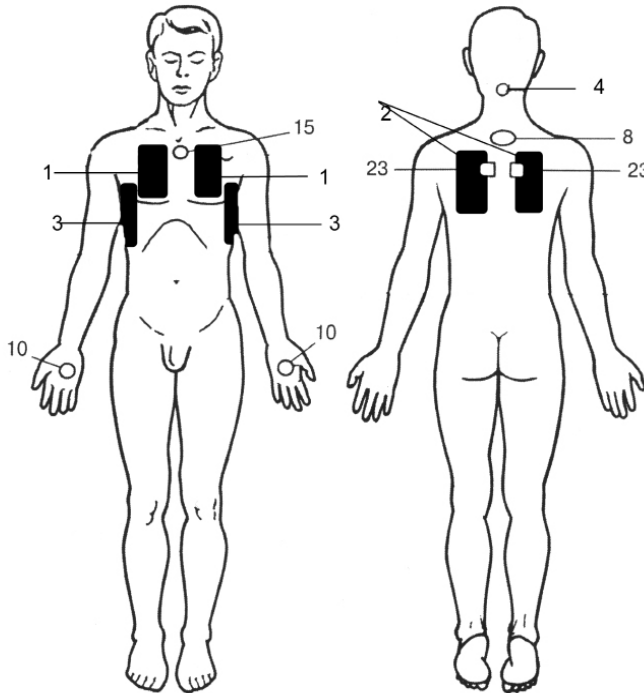
3rd day

UST - Zone 3 (the right and left field side of the chest).

MLT Rd - Zone 10 (palmar surface of the hand).

MLT IR - Zone 8 (C8 projection D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
1; 2; 3	4; 8; 23	4; 10; 15



## J18 PNEUMONIA

**Pneumonia** - inflammation of infectious origin, manifested by organic and functional lesions of the bronchi, and interstitial parenchymal tissue, blood and lymph vessels of the lungs.

### **Etiopathogenesis**

The most common cause - Gram-positive bacteria: pneumococci (from 40 to 60%), Staphylococcus (from 2 to 5%), streptococci (2.5%); Gram-negative bacteria: bacillus Friedlander (from 3 to 8%), Haemophilus influenzae (7%), viral and fungal infections. Also pneumonia may develop from exposure of non-infectious factors on chest : ionizing radiation, toxins, allergic agents.

The infectious pathogens of pneumonia penetrate into the lungs by bronchogenic, hematogenous or lymphogenous ways. When having a reduced bronchopulmonary protective barrier in the alveoli, the infectious inflammation develops, which extend to other departments of the lung tissue through interalveolar the permeable walls. The alveoli form exudate, which prevent the gas oxygen exchange between the lung tissue and blood vessels. Then develop the oxygen and respiratory failure, and in the case of complicated pneumonia – heart failure.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	75; 80	US - 3 on one area, up to 12 totally; MLT - 15

### **METHOD OF TREATMENT**

Position of the patient - lying.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 8-12.

Repeated treatment: 1-3 courses intermittently 1.5-2 months break.

Possible combination with other treatments:

- Drug therapy;
- EHF-puncture;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable)

on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

Thorax divided into six fields: the right and left front, right and left rear and 2 side.

Usually 2 field are used for one session for the impact of UST (excluding the blasts of the sternum and the heart) and 2 zones for the impact of MLT.

UST - Zone 1 (the right and left field in front of the chest);

- Zone 2 (the right and left field back of the chest);

- Zone 3 (the right and left field side of the chest).

MLT Rd - Zone 15 (the projection of the thymus gland)

- Zone 4 (zone of the medulla oblongata);

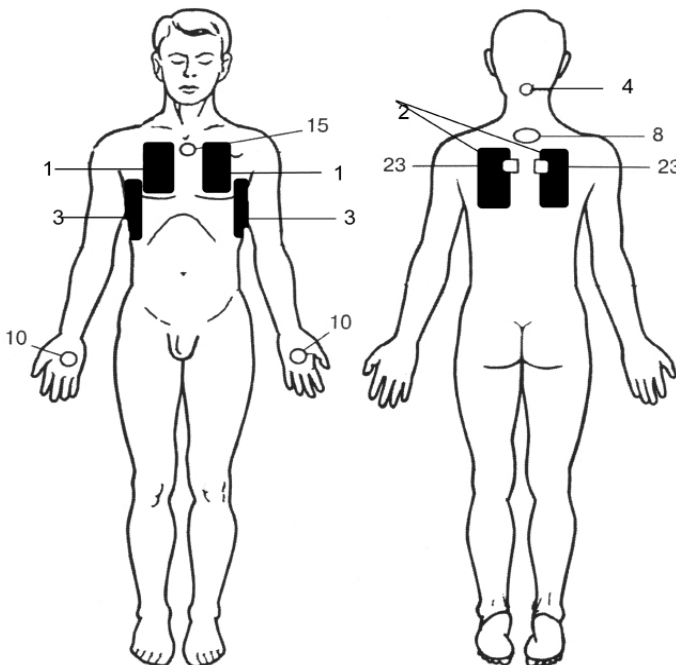
- Area 10 (palmar surface of the hand).

MLT IR - Zone 23 (paravertebrally, D3 - D6 area of segmental innervation of the bronchi);

- Zone 4 (zone of the medulla oblongata);

- Zone 8 (C8 projection D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
1; 2; 3	4; 8; 23	4; 10; 15



## J.45 BRONCHIAL ASTHMA

**Bronchial asthma** - allergic or infectious and allergic disease, manifested by periodically advancing attacks of breathlessness, having different strength and duration (from several hours to several days).

### **Etiopathogenesis**

The emergence of an attack is caused by spasm of the bronchial tubes, mucous membrane swelling and obstruction of discharge of mucus secreted in abundance. Infectious agents also are an important component in the pathogenesis of asthma, since microorganisms, their metabolic products can act as allergens causing sensitization. In addition, continuous contact supports infection inflammation of the bronchial tree in the active phase, which reduces the body's sensitivity to exogenous allergens.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	8,0	US - 2 times zone № 5; 2 times zone № 16; 30 sec. on zone № 12. MLT - 10-15

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: in the acute phase - daily, while improving the state - every other day.

Number of treatments: 10.

Repeated treatment in a month.

Possible combination with other treatments:

- Drug therapy;
- Laser and EHF-puncture;
- physiotherapy.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed via the contact medium - 2% novocaine lanolin ointment; hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

UST - Zone 5 (projection sleepy glomus - side of the neck)

- Area 12 (subclavian area)



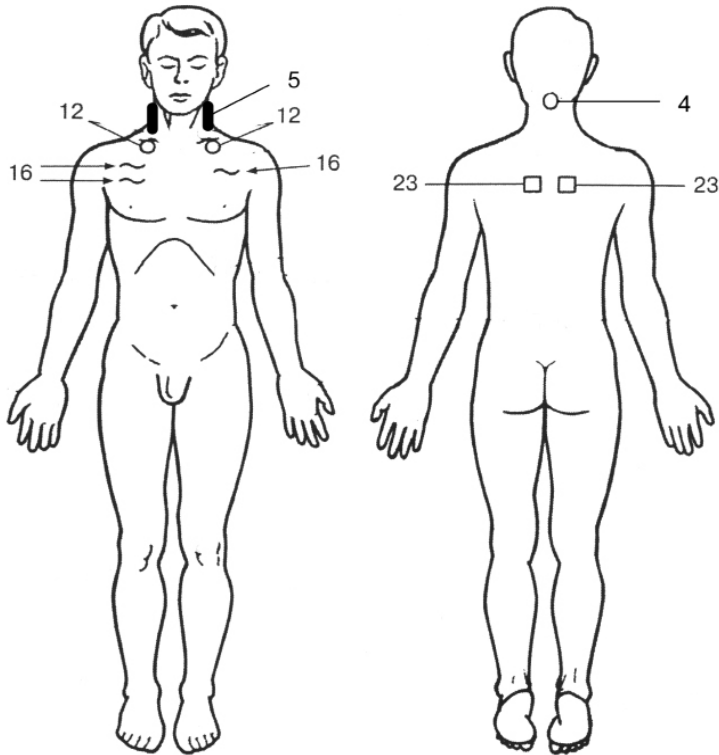
- A zone 16 (6-8 intercostal space on the left and right).

Zones number 5 and 12 to alternate every other day.

MLT Red - Zone 4 (zone of the medulla oblongata).

MLT IR - Zone 23 (paravertebrally, D3 - D6 area segmental innervation of the bronchi).

Influence zones		
US	MLT IR	MLT Rd
5; 12; 16	23	4



## J01 ACUTE SINUSITIS (ANTRITIS)

**Sinusitis** is an inflammation of the maxillary (maxillary paranasal) sinuses. It is accompanied by difficulty of nasal breathing , muco-purulent discharge from nasal passages, intense pain in the nose and wings of the nose, swelling of the cheeks and eyelid on the side of lesion, rise in body temperature.

### **Etiopathogenesis**

Polyetiology disease, which is based on a whole range of reasons. Sinusitis develops due to decreased protective function of the mucous membrane of the paranasal sinuses and nasal cavity; general and local immunity disorders. A considerable role in morbidity can play anatomical factors (congenital or traumatic deformity of the nasal septum, polypous growths in the nasal cavity), climatic factors. The inflammatory process may be potentiated both by bacterial (streptococcus, Haemophilus influenzae, Moraxella, E. coli), and viral (adenovirus, parainfluenza, respiratory syncytial virus) microflora. It is believed that the nasal septum deformation sooner or later entail a violation of air circulation in the paranasal sinuses, which prevents the removal of these mucus. The oxygen partial pressure decreases. All this reduces protection of mucosal nasal against the penetration of infections.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	2,5	UST – 3-5 on the sinuses, MLT - 10-15

### **METHOD OF TREATMENT**

Position of the patient - lying.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Repeated treatment: 1,5-2 months.

Possible combination with other treatments:

- Drug therapy;
- Laserpuncture;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through the contact medium (water lens, medication, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus or in paravertebral reflex zones and the zone of the medulla oblongata.

UST - Zone 7 (projection of the maxillary sinus to the right / left).

MLT Rd - Zone 15 (the projection of the thymus gland);

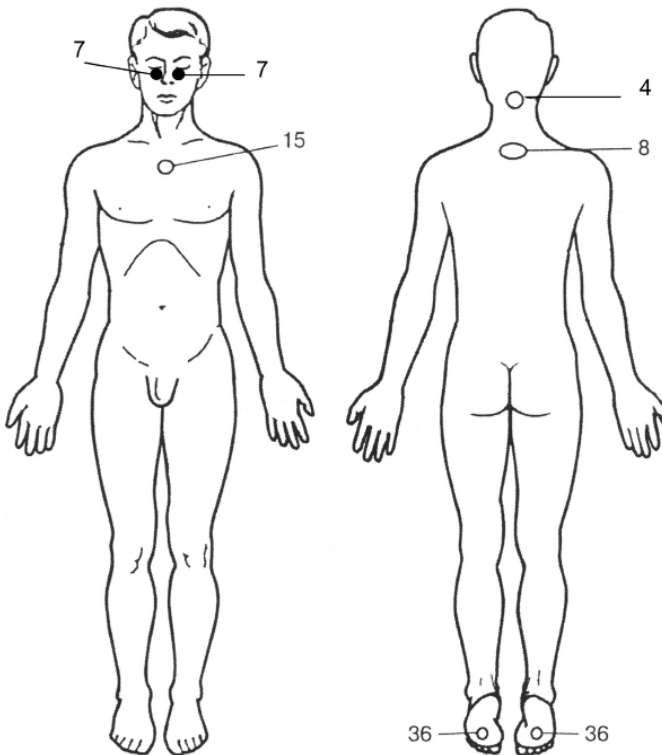
- Area 36 (the plantar surface of the foot).

MLT IR - Zone 4 (zone of the medulla oblongata);

- Zone 8 (C8 projection D2 vertebral segments).

Possible is phonophoresis of hydrocortisone, aloe, FIBS

Influence zones		
US	MLT IR	MLT Rd
7	4; 8;	15, 36



## J01 ACUTE SINUSITIS (FRONTAL SINUSITIS)

Frontitis is an inflammation of frontal sinus.

### **Etiopathogenesis**

The infection (bacterial, virus, fungal) getting into bosoms from nose at acute cold (rhinitis) is the reason of acute frontitis. Most often the acute frontitis develops as complication after flu and ARVI, and also some infectious diseases (scarlet fever, diphtheria, etc.). Among other reasons are the injuries of nose and perirhinal bosoms.

### **TREATMENT SCHEME:**

On the forward panel of the device we expose the parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	8,0	US – up to 10 totally MLT - up to 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Repeated treatment: 1,5-2 months.

Possible combination with other treatments:

- Drug therapy;
- Laserpuncture;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through the contact medium (water lens, medication, etc.).

MLT is carried out simultaneously with a contact UST. Inductors set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

UST - Zone 7 (projection of the maxillary sinus to the right / left).

MLT Rd - Zone 15 (the projection of the thymus gland);

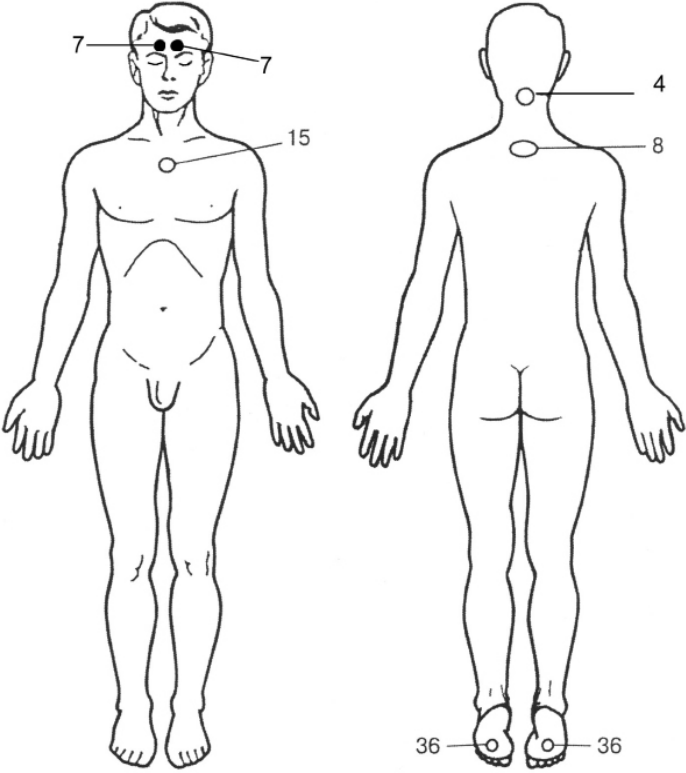
- Area 36 (the plantar surface of the foot).

MLT IR - Zone 4 (zone of the medulla oblongata);

- Zone 8 (C8 projection D2 vertebral segments).

Possible is phonophoresis of hydrocortisone, aloe, FIBS.

Influence zones		
US	MLT IR	MLT Rd
7	4; 8	15, 36



## J03 ACUTE TONSILLITIS

**Tonsillitis** is an inflammation of the tonsils.

### **Etiopathogenesis**

Polyetiologic disease, the pathogenesis of which is largely determined by the state of immunological activity of lymphoid tonsil tissue.

The occurrence of inflammation of the tonsils is caused by a bacterial infection, failure of immunological defense mechanisms of the tonsils.

A significant role in the pathogenesis of chronic tonsillitis has: intoxication, general and local cooling, poor nutrition, poor working and living conditions. Of decisive importance in the origin and development of tonsillitis is the change in the body's reactive ability.

Predisposing factors of tonsillitis include:

- recurrent acute tonsillitis,
- presence of chronic foci of inflammation in the oral cavity,
- presence of foci of chronic inflammation of the nose,
- presence of chronic foci of inflammation of the paranasal sinuses

### **TREATMENT SCHEME:**

On the front panel of the device are the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	2,9	US - 2-3 on zone, MLT - to 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 3-7.

Re-treatment: 2 months.

Possible combination with other treatments:

- Drug therapy;
- Laser-puncture;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly through the contact medium (drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

**ATTENTION!**

UST - 6a zone (area of the jugular notch to the right / left)

- Zone 6 (submandibular area below the angle of the mandible).

MLT Rd - 15 area (the projection of the thymus gland)

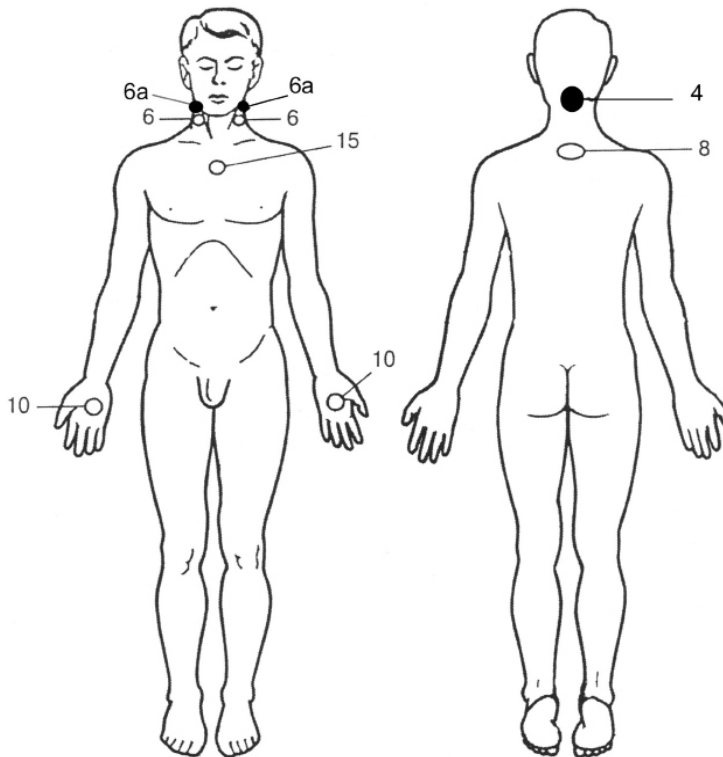
- 10 zone (palmar surface of hands).

MLT IR - 4 zone (zone of the medulla oblongata)

- Zone 8 (projection of the vertebral segments C8 D2).

Possible is the phonophoresis of hydrocortisone, aloe juice

Influence zones		
US	MLT IR	MLT Rd
6, 6a	4; 8	15, 10



## J00 ACUTE NASOPHARYNGITIS (RHINITIS)

**Rhinitis** is characterized by a constant discharge of mucus from the nose, from time to time coming difficulty of nasal breathing, because nasal mucosa is often thickened, growing that often leads to narrowing of the nasal passages.

### **Etiopathogenesis**

Acute rhinitis is often one of the symptoms of infectious diseases (acute respiratory disease, influenza, whooping cough, scarlet fever, measles, mumps, and others.), rare - it appears as a distinct disease with direct effect on the mucous membrane of the nasal cavity by infections, thermal, mechanical, chemical, stimuli.

The main value in the occurrence of acute rhinitis has reduced total and local reactivity of the organism, violation of protective neuromuscular reflex mechanisms.

Contributing factors in the majority of cases is general cooling of the body or of it.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameterse:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	2,5	US - 5 totally MLT - 10 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10.

Re-treatment: in 2 months.

Possible combination with other treatments:

- Drug therapy;
- Laser-puncture;
- Phyto-irrigation.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is carried out directly via the contact medium - water lens).

MLT is carried out simultaneously with a contact UST. Inductors set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

### **ATTENTION!**

*At hyperplastic and atrophic forms of rhinitis usually is carried out phonophoresis of hydrocortisone, peloidin, splenin (with atrophic form); hydrocortisone or chymotrypsin*



lidazy (in hyperplastic form). To improve the absorbability of drugs to the contact medium is added dimexide (Dimexidum 2.6 g per 100 ml of distilled water).

UST - Zone 2 (nasal bridge and sidewalls).

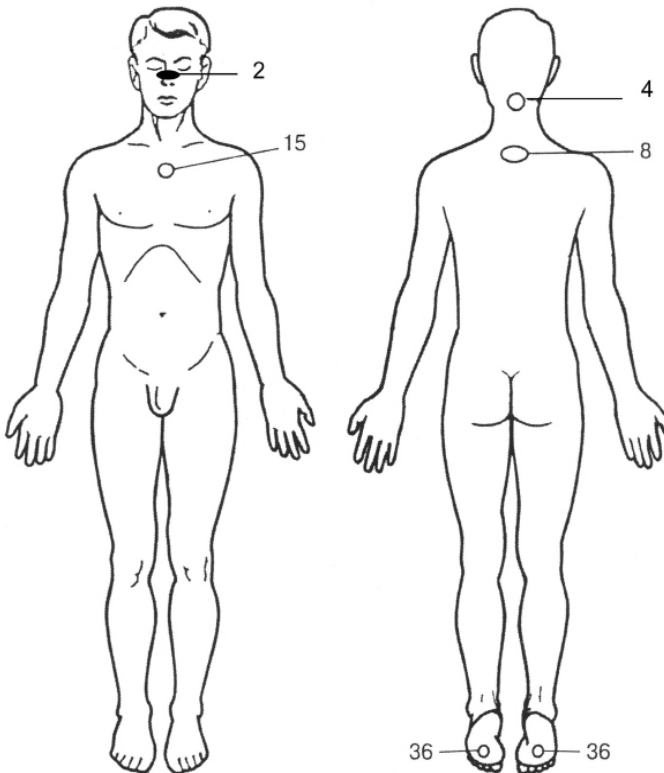
MLT Rd - Zone 15 (the projection of the thymus gland)

- Area 10 (palmar surface of hands).

MLT IR - Zone 4 (zone of the medulla oblongata)

- Zone 8 (C8 projection D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
6, 6a	4; 8	15, 10



## J31.2 CHRONIC PHARYNGITIS

**Chronic pharyngitis** is a chronic inflammation of pharyngeal mucosa.

Symptoms: feeling of irritation, a foreign matter in a throat, moderate pain when swallowing, a congestion of large amount of viscous mucus that causes the necessity to clear the throat or expectorate constantly.

### **Etiopathogenesis**

Development of disease is caused by local long irritation of throat mucous membrane. Developing of chronic pharyngitis is promoted by repeated acute inflammations of a throat, chronic tonsillitis, long-lasting inflammatory diseases of a nose and perirhinal sinuses, and violation of nasal breath.

The hypertrophic form of pharyngitis is characterized by thickening of all layers of a mucous membrane, increase in number of epithelium ranks. The mucous membrane becomes thicker and more dense, blood and lymphatic vessels are expanded, in perivascular space lymphocytes are defined. The lymphoid formations disseminated through a mucous membrane are normal in the form of hardly noticeable granules, considerably are thickened and extend: there is a hyper secretion.

Sharp thinning and dryness of a mucous membrane of a throat is characteristic of atrophic chronic pharyngitis; in the expressed cases it shining «varnished». The size of mucous glands and their number are reduced; the desquamation of an epithelial cover is observed.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	9,5	US - 10 totally MLT - 10 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 6-10.

Repeated treatment in a month.

### **ATTENTION!**

MLUST is combined with electrophoresis of 0.5% zinc sulfate (+) by the method of larynx electrophoresis.

Possible combination with other treatments:

- Drug therapy;

- Laser-puncture;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed via the contact medium (water glass, petroleum jelly, ultrasound gel, medication, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

UST - Zone 3 (larynx).

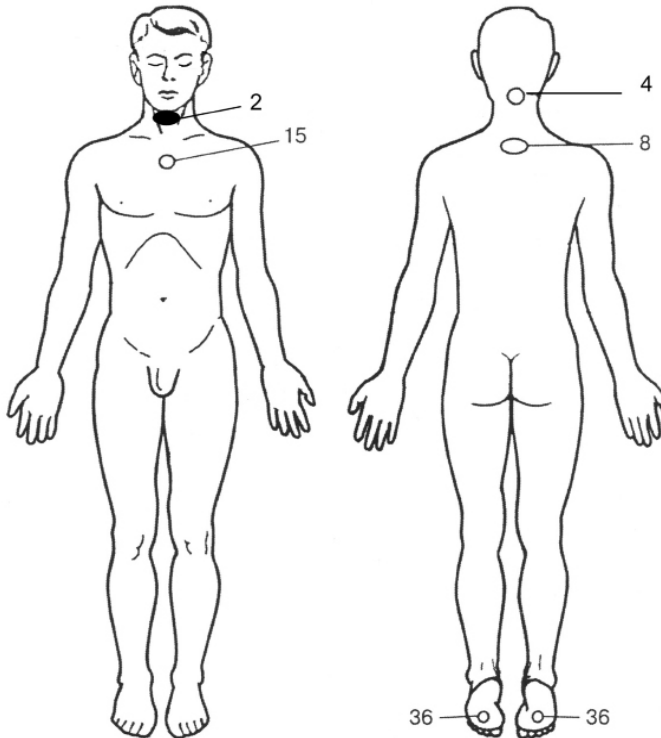
MLT Rd - Zone 15 (the projection of the thymus gland)

- Area 10 (palmar surface of hands).

MLT IR - Zone 4 (zone of the medulla oblongata)

- Zone 8 (C8 projection D2 vertebral segments)

Influence zones		
US	MLT IR	MLT Rd
3	4; 8	15, 10



## J37 CHRONIC LARYNGITIS AND TRACHEITIS

**Chronic laryngotracheitis** - chronic inflammation of the larynx and trachea mucosa, with accompanying inflammation of other parts of the upper respiratory tract (nose, pharynx).

### **Etiopathogenesis.**

In the event of chronic laryngotracheitis matter:

- Repetitive and untreated acute inflammatory diseases of the larynx,
- Presence of chronic inflammation foci of the upper and lower respiratory tract,
- Infectious diseases,
- Occupational hazards (chemical irritants, dust, overvoltage votes, vapors, gases, dry air)
- Sharp temperature fluctuations,
- Tobacco smoke and alcohol.
- Disorders of blood circulation and metabolism,
- Degenerative disorders
- Allergic condition of the body.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	9,5	US - 5 totally MLT - 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-12.

Repeated treatment in a month.

**ATTENTION!**

The drug at phonophoresis is hydrocortisone.

Possible combination with other treatments:

- Drug therapy;
- Aerosol;
- Balneotherapy.

Methods of exposure: labile and stable on the recommended areas.

UST is performed via the contact medium (water glass, petroleum jelly, ultrasound gel, medication, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

UST - Zone 3 (larynx)

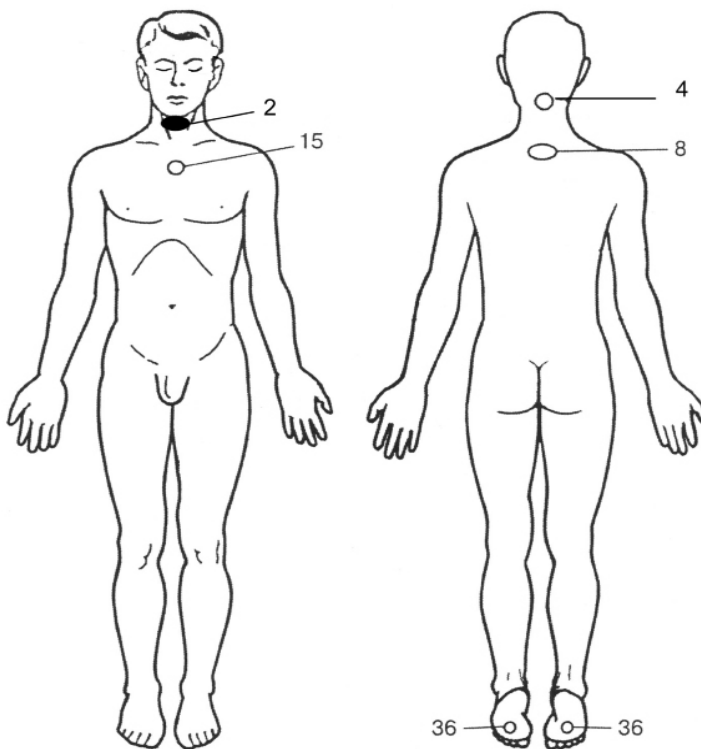
- Zone 9 (the side surface of the thyroid cartilage).

MLT Rd - Zone 15 (the projection of the thymus gland)

- Area 36 (the plantar surface of the foot).

MLT IR - Zone 8 (C8 projection D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
3; 9	8	15, 36



## H65- H66 CHRONIC SUPPURATIVE OTITIS MEDIA

**Chronic suppurative otitis media** - inflammation of the middle ear.

Symptoms: prolonged suppuration of the ear, hearing loss.

### **Etiopathogenesis**

Often it is caused by several pathogens simultaneously. Transition of acute otitis media in chronic is due to the action of a number of adverse factors: the virulence of the pathogen, which can be resistant to the used antibacterial agents, reducing the body's resistance, violation of local and general immune defense, blood diseases, diabetes, rickets and other significant role in the development of chronic otitis media plays a pathological condition of the upper respiratory tract, such as adenoids, the curvature of the nasal septum, chronic sinusitis, hypertrophic rhinitis. Observed in this violation of the drainage and ventilation functions of Eustachian tubes lead to the difficulty of evacuating the contents of the tympanic cavity and disruption of the aeration of the middle ear cavity. This in turn interferes with the normal healing of the tympanic membrane perforation after acute suppurative otitis media, which leads to the formation of the perforation counter.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-4	75-99	3,3; 5,8; 9,2	US - 3 totally MLT - up to 5 on one zone

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-8.

Repeated treatment in a month.

Possible combination with other treatments:

- Drug therapy;
- Ultrasound puncture.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed via the contact medium (Vaseline, ultrasound gel, medication, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable)

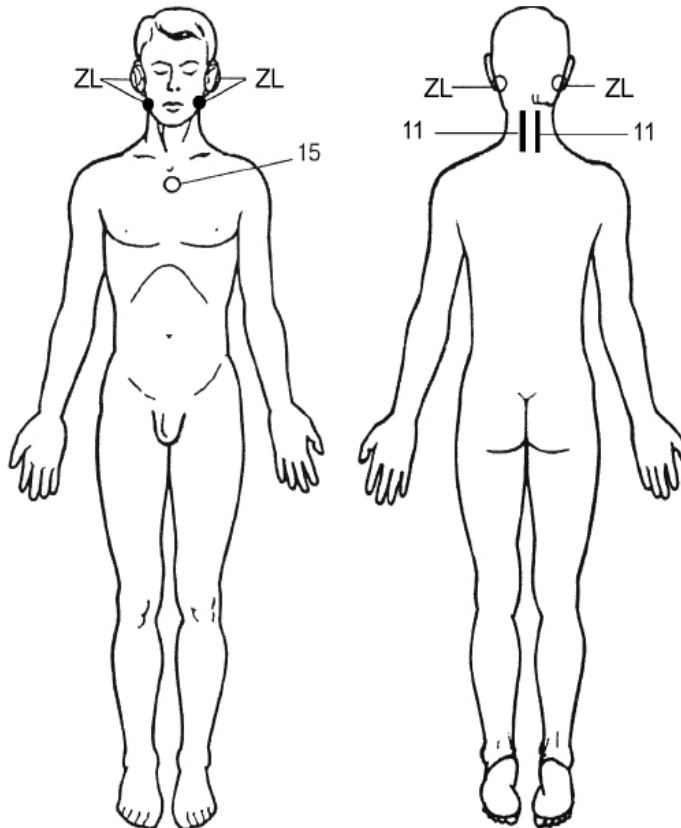
on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

UST - Zone 11 (paravertebrally projection of C2-C8 vertebral segments).

MLT Rd - Zone 15 (the projection of the thymus gland).

MLT IR - ZL Zone (locus zone - pathological changes - the area of the external auditory canal, mastoid, the angle of the mandible on the affected side of the ear).

Influence zones		
US	MLT IR	MLT Rd
11	ZL	15



## H81.0 MÉNIÈRE'S DISEASE, SENSORINEURAL HEARING LOSS

### Etiopathogenesis

Hearing impairment can be acquired and congenital. In the event of proven SNHL (sensorineural hearing loss) acquired is the role of: infectious diseases, cardiovascular disorders, stress, exposure to ototoxic industrial and household substances, a number of drugs, injury, hearing loss, which occurs as a result of physiological aging. Among congenital SNHL are isolated hereditary causes and pathology at birth (hypoxia).

The main pathogenic factor is an increase in the number of labyrinth fluid (endolymph) and increased inter labyrinth pressure.

In the majority of patients are detected the activation of lipid peroxidation and reduced antioxidant activity of the blood system due to the presence of their comorbidities. Emerging disorders of brain and systemic microcirculation is one of the pathogenetic factors cochleovestibular violations.

### TREATMENT SCHEME:

On the front panel of the device are set the following parameters:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-4	75-99	5; 10; 50; 99	UST - 2 to zone, to 10 totally MLT -3 to zone, 15 totally

### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 21.

Re-treatment: after 6 months.

Possible combination with other treatments:

- Drug therapy;
- Laser-puncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed via the contact medium (Vaseline, ultrasound gel, medication, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.



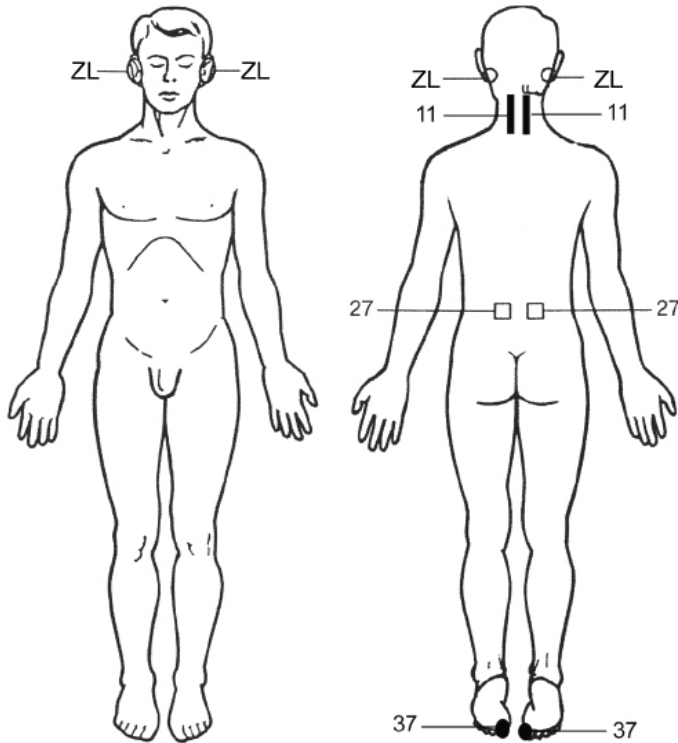
UST - Zone 11 (paravertebrally projection of C2-C8 vertebral segments).

MLT Rd - Zone 27 (paravertebrally D11-L1, the projection of the segmental innervation of the kidney);

- Area 37 (the big toes pads).

MLT IR - ZL Zone (locus zone - pathological changes - the area of the external auditory canal, mastoid).

Influence zones		
US	MLT IR	MLT Rd
11	ZL	27; 37



## **K00-K14 DISEASES OF ORAL CAVITY, SALIVARY GLANDS AND JAWS**

### **Etiopathogenesis**

The main etiological factor inducing inflammation is microorganisms of so-called dental plaque, which is tightly adherent to the tooth surface. Its formation is influenced by many factors of local and general character: poor oral hygiene, reduction of mouth local immunity, a change in the acid-base balance of the saliva in the direction of acidosis, which contributes to the colonization of microorganisms, increasing the viscosity of the mixed saliva, salivation decrease, accompanied by a decrease in immunoglobulin levels and particularly the secretory IgA, lysozyme, and other protective factors.

Among the local factors which affect the retention of the microbial plaque, colonization of microorganisms important is the presence of cavities; the materials from which made fillings and dentures.

Exposure is carried out before a meal or 2 hours after a meal (alcohol and smoking are contraindicated, requires an appropriate diet).

5 minutes before the start of the procedure to drink 300 ml of liquid (herbal solutions, mineral water, etc.).

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	50-75	1,7; 2,9; 9,5	US - 10 totally MLT - 20 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-8.

Re-treatment: two weeks.

Possible combination with other treatments:

- Dental procedures;
- Drug therapy;
- Herbal medicine;
- Vacuum massage;
- Laserpuncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST- region 25 (projection D7-L2 segmental innervation zone of the liver);

- Area 27 (paravertebrally, D7-L2 segmental innervation area of the kidneys);

- Area 17 (the projection of the liver);

- Area 21 (the projection of the celiac plexus).

MLT Rd - Zone 10 (palmar surface of hands);

- Area 36 (the plantar surface of the foot).

MLT IR - ZL Zone locus (lesions)

- Zone 4 (the projection of the brain stem);

- Zone 8 (C7-D2 projection of the vertebral segments).

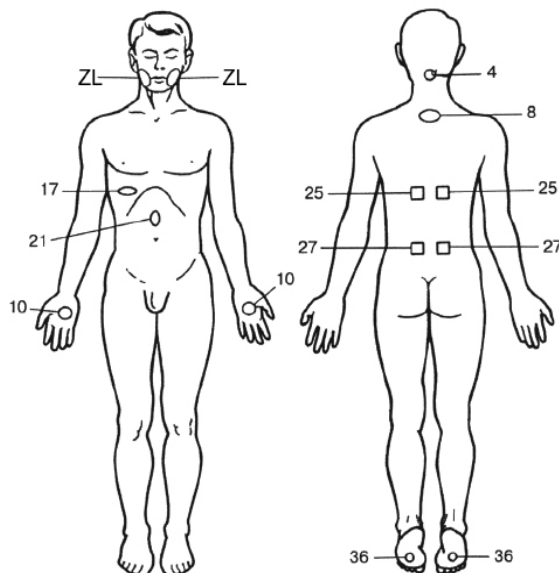
ATTENTION!

Impact zones alternate in the following order:

Day 1 - 17, 25 (UST); 10 (MLT R); 4 (MLT IR).

Day 2 - 21, 27 (UST); 36 (MLT R); 8 (MLT IR), etc.

Influence zones		
US	MLT IR	MLT Rd
25; 27	ZL	17; 21; 4; 8; 10; 36



## M19.2- M24.6 ARTHROSIS OF THE TEMPOROMANDIBULAR JOINT

Inflammatory or inflammatory-dystrophic disease of the temporomandibular joint.

### **Etiopathogenesis**

Common causes of disease should include metabolic disorders in the body, neurodystrophic, endocrine disorders, and infectious diseases. Local concern: long current inflammatory process in the joints, excessive load on the articular surface of the head of the lower jaw, which may be associated with neuromuscular disorders of the maxillofacial region, with the absence of teeth, especially the side, the deformation of the surface occlusivedentition and abnormal abrasion. These factors can be combined with each other.

Degenerative processes in the joint may develop as a result of the impact of general and local factors - a violation of both cellular and extracellular mechanisms for trophism. The general mechanism of development of TMJ osteoarthritis is that gradually the cartilage covering the articular surface of the condyle head undergoes degeneration. Infection occurs by hematogenous-metastatic or by contact way, joint capsule inflame, and then there is the destruction of cartilage and meniscus.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	50-75	57; 95	US - 2 at zone. MLT - 15 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-8.

Re-treatment: two weeks.

Possible combination with other treatments:

- Drug therapy;
- Phytotherapy.
- Laserpuncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

- US - Zone 25 (projection D7-L2 segmental innervation zone of the liver)
- Area 27 (paravertebrally, D7-L2 segmental innervation area of the kidneys)
- Area 17 (the projection of the liver)
- Area 21 (the projection of the celiac plexus).

- MLT Rd - Zone 10 (palmar surface of hands)
- Area 36 (the plantar surface of the foot).

MLT IR - ZL locus zone (pathological changes - below the ear lobe at the angle of the mandible), - Zone 4 (the projection of the brain stem), - Zone 8 (C7-D2 projection of the vertebral segments).

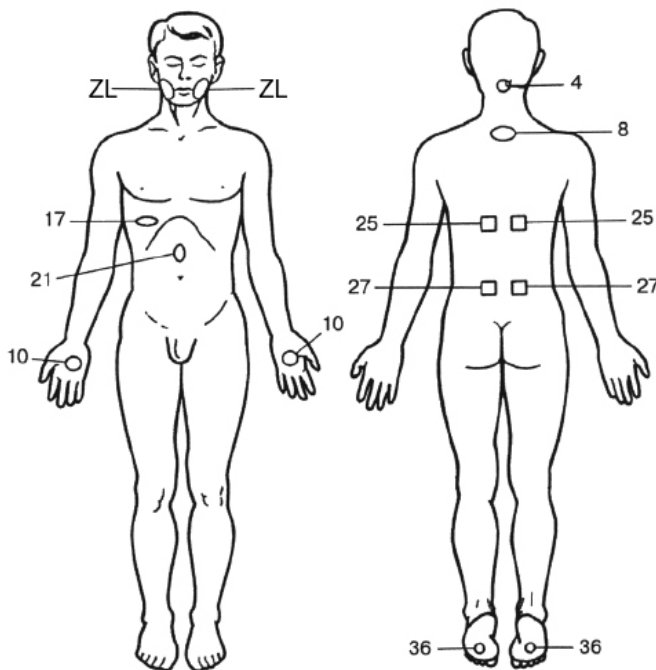
ATTENTION!

Impact zones alternate in the following order:

Day 1 - 17, 25 (UST); 10 (MLT R); 4 (MLT IR).

Day 2 - 21, 27 (UST); 36 (MLT R); 8 (MLT IR), etc.

Influence zones		
US	MLT IR	MLT Rd
25; 27	ZL	17; 21; 4; 8; 10; 36



## N00-N99 DISEASES OF THE GENITOURINARY SYSTEM

### F98 ENURESIS

**Enuresis** - is a repeated inability to control urination, often during sleep in children.

#### **Etiopathogenesis**

Etiology factors - helminth infections, fatigue, genitourinary disease and ENT organs, beriberi, neuroses. In pathogenesis an important role is played by autonomic disorders. A significant role in the occurrence of enuresis plays neurosis. It is believed that psychotraumatic situation cause violations of the normal activity of the cortex of the cerebral hemispheres. An important factor contributing to the emergence of enuresis, some researchers believe is secretion dysfunction of biologically active substances that affect the bladder (serotonin, histamine, prostoglyutsin, and most important - vasopressin).

#### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	2,8	US - up to 10 totally, MLT - 20 totally.

#### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: every other day.

Number of treatments: 10.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Zonal EHF-therapy and EHF puncture;
- Homeopathy;
- Herbal medicine;
- Psychological correction.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

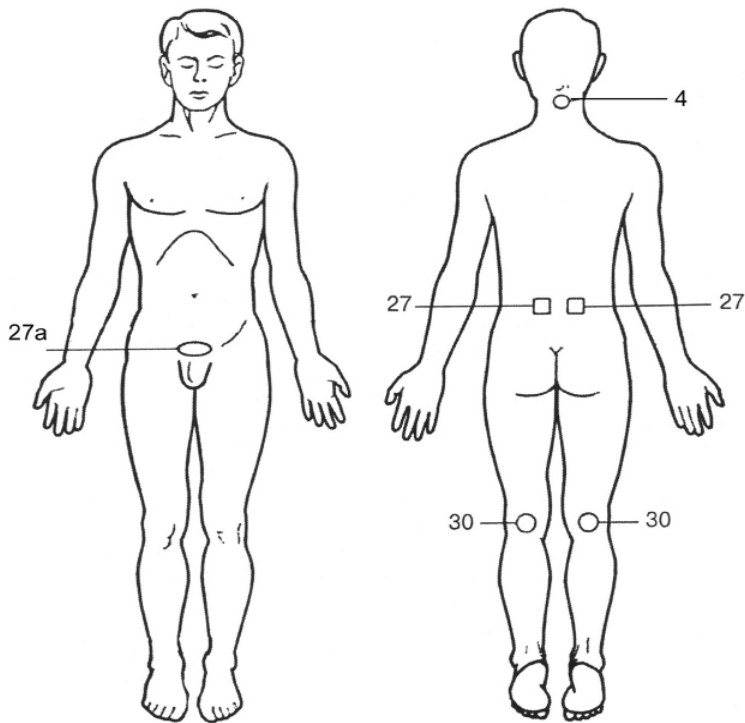
UST - zone 27a (the projection of the bladder).

MLT Rd - Zone 4 (the medulla oblongata);

- Area 30 (popliteal fossa).

MLT IR - Zone 27 (paravertebrally projection D7-L1 segmental innervation of the kidney area).

Influence zones		
US	MLT IR	MLT Rd
27a	27	4; 30



## N48.4 IMPOTENCE

**Erectile dysfunction (impotence)** - the inability to achieve and / or maintain an erection sufficient for satisfactory sexual activity.

### **Etiopathogenesis**

Multifactorial condition. Any factors that lead to a decrease in blood flow to the cavernous bodies (arterial insufficiency of the penis), or to increase of the outflow from them (veno-occlusive dysfunction) may be the cause of erectile disorders. It can be: chronic disease (atherosclerosis, hypertension, saharnymy diabetes, depression, neurosis-like disease.

Erectile disorders often occur under the influence of environmental factors - radiation, electromagnetic radiation.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	9,4; 20; 73; 75	US - 8 totally, MLT - 10 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10-12.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Physio-reflex-therapy;
- Psychological correction;
- Homeopathy;
- Phytotherapy.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

US - Zone 1 (the perineum).

MLT Rd - Zone 4 (the medulla oblongata);

- A zone 36 (the foot plantar surface of the left / right);



- Area 15 (the projection of the thymus gland);
- Area 30 (popliteal fossa on the right / left).

MLT IR - Zone 27 (paravertebrally projection D7-L2 segmental innervation area of the kidneys);

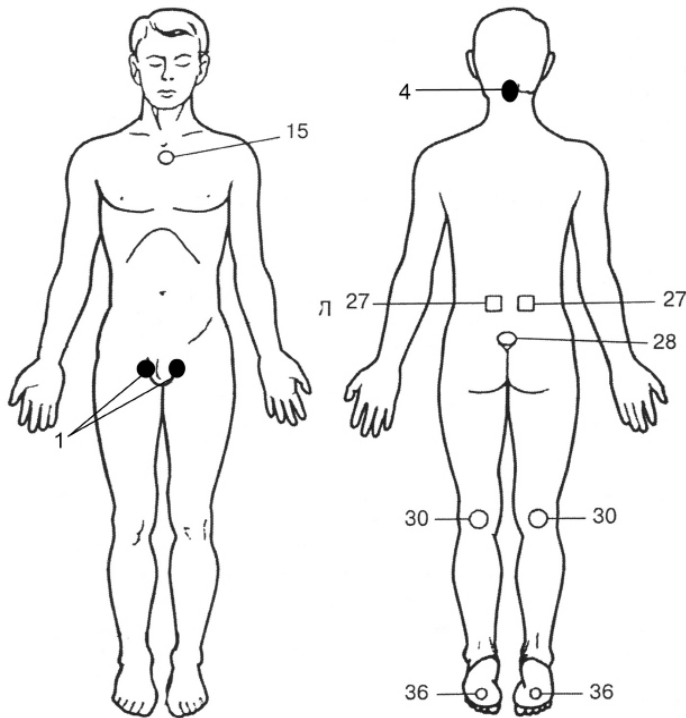
- Zone 28 (Michaelis diamond).

Impact zones alternate in the following order:

1st Day - 1 (UST); 4; 30 (MLT IR); 27 (MLT IR).

Day 2 - 1 (UST); 15; 36 (MLT Rd); 28 (MLT IR), etc.

Influence zones		
US	MLT IR	MLT Rd
1	28; 27	4; 15; 36; 30



## N41.1 CHRONIC PROSTATITIS

**Prostatitis** - acute or chronic inflammation of the prostate gland (prostate).

Symptoms: a burning sensation or pain in the perineum, frequent urination, fever, pain in the sacrum.

### **Etiopathogenesis**

Chronic prostatitis occurs at penetration of micro-organisms into the prostate tissue and an important role is played by chlamydial infection (60-70% of cases). Equally important are other micro-organisms (viruses, mycoplasmas, Gardnerella, Trichomonas, etc.) and their associations.

Etiological predisposing factors: immune deficiency, age-related changes, hormonal disorders, especially of the venous system. In the development of chronic prostatitis special attention given to poor circulation in the veins of the pelvic and emerging stagnation (hypothermia, inflammation of hemorrhoidal veins, inactivity). Special role play innervation disorders, hormonal changes, immunological disorders.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	9,4; 20; 73; 75	US - 10 totally, MLT - 20 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 12-15.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Physio-reflex-therapy;
- Psychological correction;
- Drug therapy;
- Prostate massage.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed directly on the body or through the contact medium (drug - hydrocortisone).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST- zone 1 (the perineum);

- Area 27 (paravertebrally projection D7-L2 segmental innervation area of the kidneys).

MLT Rd - Zone 36 (the plantar surface of the foot to the left / right);

- Area 15 (the projection of the thymus gland);

- Area 30 (popliteal fossa on the right / left).

MLT IR - Zone 28 (Michaelis diamond);

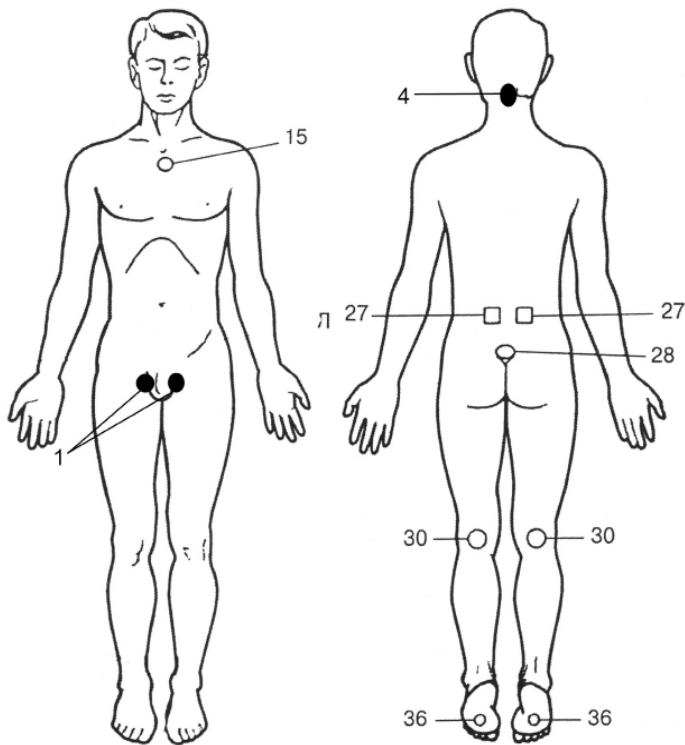
- Zone 4 (the medulla oblongata).

Impact zones alternate in the following order:

1st day - 1; 27 (UST); 15; 30 (MLT Rd); 4 (MLT IR).

Day 2 - 1; 27 (UST); 15; 36 (MLT Rd); 28 (MLT IR), etc.

Influence zones		
US	MLT IR	MLT Rd
1; 27	28; 4	15; 36; 30



## N34 URETHRITIS AND URETHRAL SYNDROME

**Urethritis** - inflammation of the urethra. Symptoms: burning and itching in the urethra and perineum while urinating, pain in the lumbosacral region. Urination is often painful.

### **Etiopathogenesis**

Gonococcal infection causes gonococcal urethritis, non-gonococcal urethritis can be infectious and noninfectious. Infectious urethritis caused by bacteria, viruses, spirochetes, etc.

Non-infectious urethritis occur when urethra is damage during diagnostic and therapeutic procedures (traumatic urethritis), and as a reaction to the food and drug allergies (allergic urethritis). Infection with the urethral mucosa is embedded in the gaps and glands, causing inflammation. When venereal urethritis co-infection is possible with two or more pathogens (Trichomonas, chlamydia and others.). Morphological changes at urethritis of different origin are almost similar.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	1,2	US - 6 totally, MLT - 15 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 5-7.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Physio-reflex-therapy;
- Psychological correction;
- Drug therapy.

Methods of exposure: labile and stableo on the recommended areas.

Exposure to ultrasound is performed directly on the body or through the contact medium (drug, ultrasound gel, Vaseline).

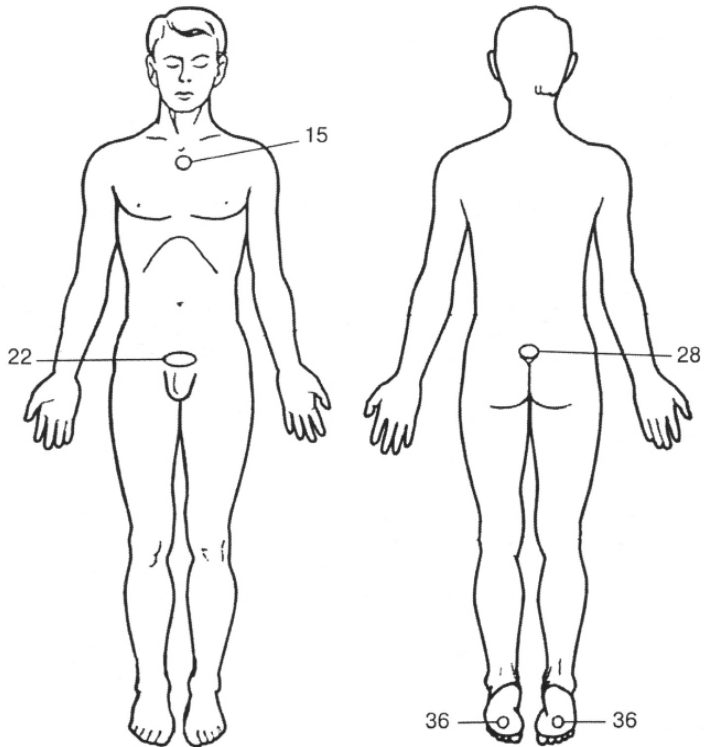
MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 22 (the projection of the anatomical neck and the bladder triangle).

MLT Rd - Zone 36 (the plantar surface of the foot to the left / right) - Zone 15 (the projection of the thymus gland).

MLT IR - Zone 28 (Michaelis diamond).

Influence zones		
US	MLT IR	MLT Rd
22	28;	15; 36



## N11 CHRONIC PYELONEPHRITIS

**Chronic pyelonephritis** - nonspecific infectious kidney disease.

### **Etiopathogenesis**

Frequent causative agents of pyelonephritis are *E. coli*, enterococci, staphylococci.

The infection gets into the kidney in the following ways:

Hematogenous way: bacteria penetrate the bloodstream into the kidney from the primary foci of infection (bones, skin, endothelium, and others.) due to diseases such as acute tonsillitis, otitis media, or abrasions, etc. By rising or urinogenic way: from the lower urinary tract. This process occurs as a result of violations of urine dynamics (reverse flow promotes entry of urine from the bladder back into the kidney). Rising through the wall of the urinary tract (ureter).

Affected are the renal parenchyma, interstitial tissue, pelvis and calyx.

The pathogenesis of chronic pyelonephritis:

1. Violation of urodynamic processes and lymph flow.
2. Effect of immune mechanisms.
3. Genetic factors.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-4	75-99	3,5; 8,1; 53; 63; 86	US - 1-3 on zone, 6 totally; MLT - 3-5 on zone, up to 10 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: 3-4 sessions daily, the next - after 1-2 days.

Number of treatments: 14-15.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Physio-reflex-therapy;
- Antibacterial medication.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed directly on the body or through the contact medium (ultrasound gel, Vaseline, a drug).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on

the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

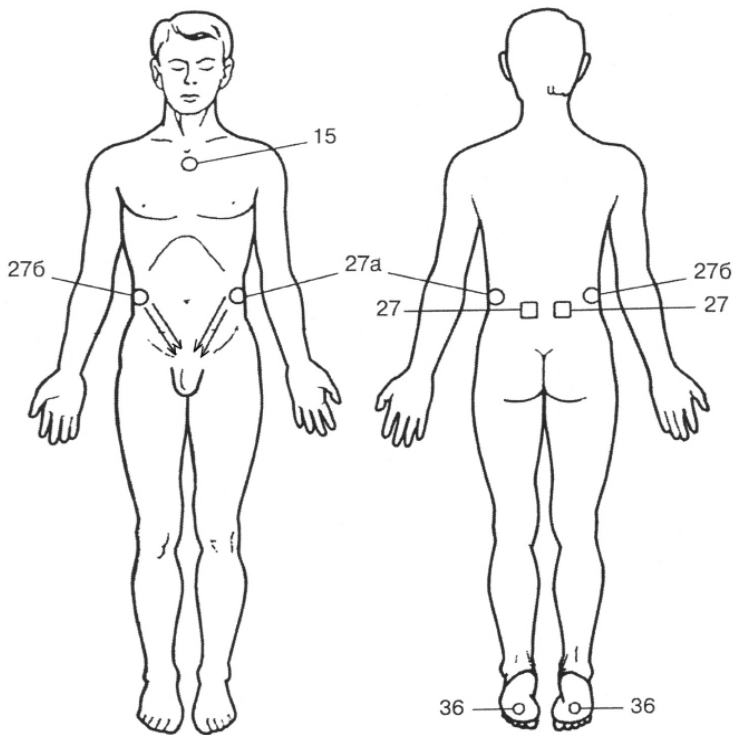
UST - Zone 27 (paravertebrally projection D7-L2 segmental innervation area of the kidneys).

MLT Rd - Zone 36 (the plantar surface of the foot to the left / right);

- Area 15 (the projection of the thymus gland).

MLT IR - zone 27a, 27b (externally inside surface of the abdomen, the end of the 12 left / right edges).

Influence zones		
US	MLT IR	MLT Rd
27	227a; 276	15; 36



## N20-N23 UROLITHIASIS

**Urolithiasis** - polietiologic disease characterized by the presence of a stone or some stones in the kidney and / or urinary tract.

### **Etiopathogenesis**

Causes of formation: hereditary disorders of urodynamics, urinary tract infection, gastrointestinal disease, liver and biliary tract disease, congenital and acquired disorders of urodynamics of the upper and / or lower urinary tract; prolonged immobilization; secondary disturbances of activity of enzymes, hormones or deficit/surplus of vitamins; disease leading to urolithiasis (osteoporosis, leukemia, bone metastases).

The pathogenesis of urolithiasis is associated with one of the three main hypotheses:

- Precipitation of crystallization;
- The formation of the matrix - nucleation;
- Lack of crystallization inhibitors.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	75-99	10-100 (P2 mode)	UST - 1-3 on zone; 7 - totally. MLT - 3-5 on zone; 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: 3-4 sessions daily, the next - after 1-2 days.

Number of treatments: the treatment is determined by the efficiency (in average 7-10).

Retreatment: if necessary, after 2 months.

Possible combination with other treatments:

- Additional electrical or magnetic stimulation of ereter or renal pelvis after MLUST procedures;

- Simultaneous with MLUST electrical stimulation of the bladder;

- Drug therapy;

- Drinking regime (preferably mineral water «NAFTA»);

- A warm bath before the MLUST procedure.

Methods of exposure: labile and stable on the recommended areas.



Exposure to ultrasound is performed directly on the body or through the contact medium (ultrasound gel, Vaseline, a drug).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

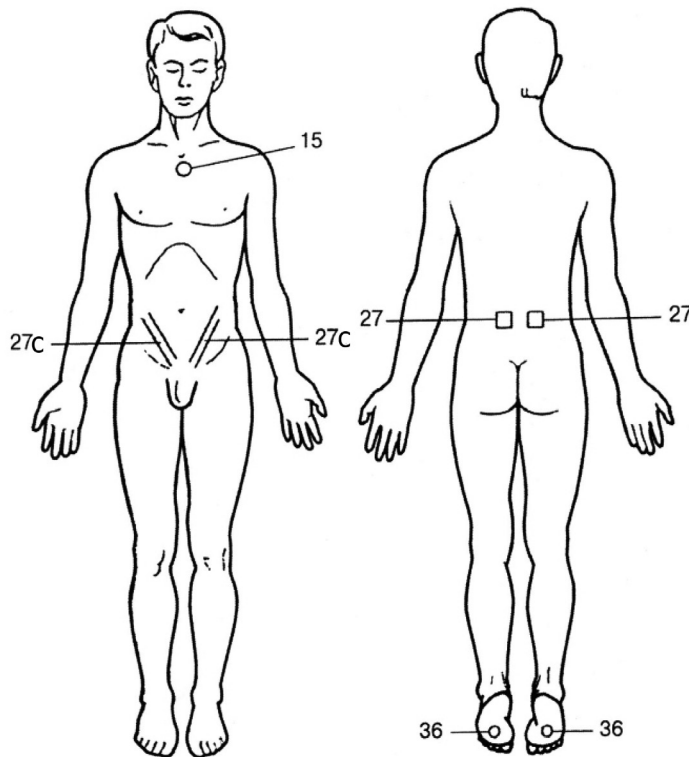
UST - area 27c (the projection of the pelvis and ureter on the side of ureter sand or the stone walkway»).

MLT Rd - Zone 36 (the plantar surface of the foot to the left / right);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D7-L2 segmental innervation area of the kidneys).

Influence zones		
US	MLT IR	MLT Rd
27c	27	15; 36



# O00-O99 PREGNANCY, CHILDBIRTH AND THE PUERPERIUM

## O92.1 CRACKED NIPPLES

**Cracked nipples** - defect, damage the skin integrity of the nipple of the mammary glands. Manifested by sharp soreness radiating to the shoulder blade while feeding your baby.

### **Etiopathogenesis**

In addition to violations of feeding technology, the appearance of cracks on the nipples can be contributed by hypovitaminosis, general malaise. Cracks often occur in women who have inverted underdeveloped nipples, thin and sensitive skin, weakened neuromuscular system. Excitable baby can damage the nipple during feeding and the lack of hygiene may contribute to the development of cracks of the nipples.

One of the cause of the cracks is the lack of capturing the nipple by child during breast-feeding, poor weaning, too frequent washing of the nipples.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2 - 3	75-99	9,4; 1,5; 3,6; 7,7	US - 1,5 at zone, MLT - 10 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 5-7.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Physio-reflex-therapy;
- Psychological correction;
- Drug therapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (drug sterile cocoa butter or other plants).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

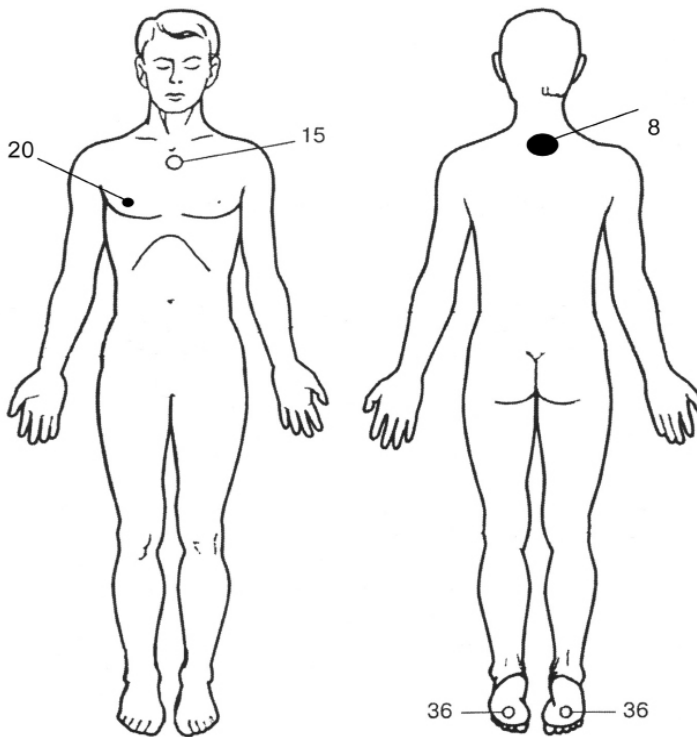
UST - Zone 20 (the injured nipple).

MLT Rd - Zone 36 (the plantar surface of the foot to the left / right);

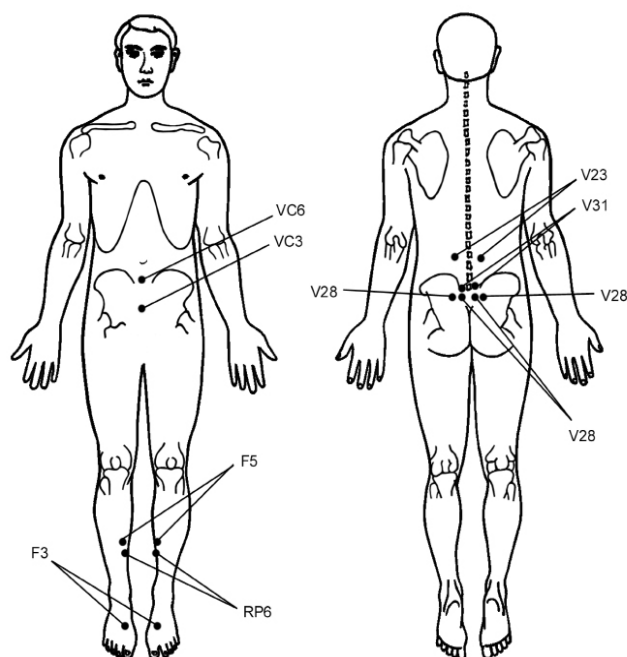
- Area 15 (the projection of the thymus gland).

MLT IR - Zone 8 (C7-D2 projection of the vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
20	8;	15; 36



## MAIN ACUPUNCTURE POINTS IN GYNECOLOGY



### N61 MASTITIS

**Mastitis** - an inflammatory disease of the mammary glands.

#### Pathogenesis

The causative agents of mastitis are staphylococci, streptococci and other pyogenic bacteria.

As the input gates of infectious agents often serve cracked nipples, rare milk ducts.

Acute onset of the disease, manifested by pain in the breast, body temperature rises.

#### TREATMENT SCHEME:

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	9,4; 98	US - 6 totally, MLT - 15 totally.

#### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 4-8.

Possible combination with other treatments:

- EHF-puncture;
- Laserpuncture;
- Psychological correction;
- Drug therapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the body or through a contact medium (drug sterile cocoa butter or other plants).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

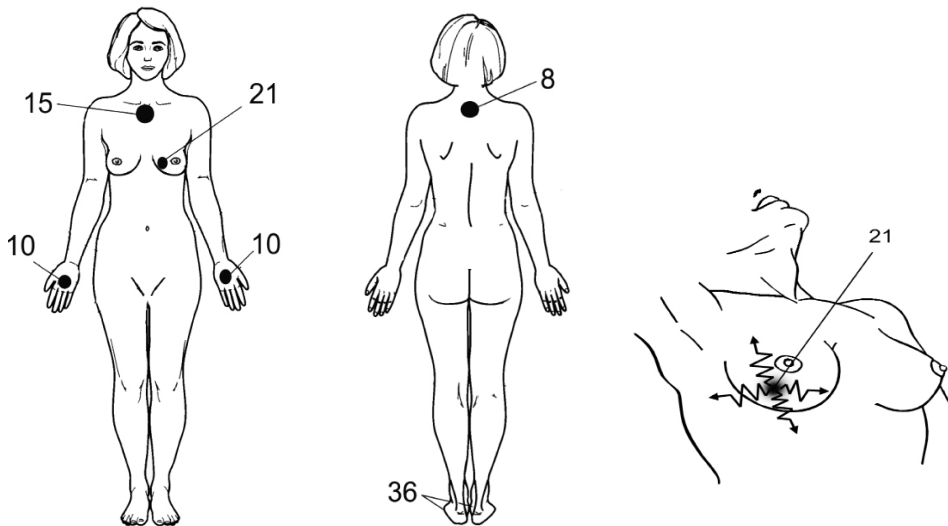
UST- zone 21 (the affected segment of the breast).

MLT Rd - Zone 36 (the plantar surface of the foot to the left / right);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 8 (C7-D2 projection of the vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
21	8;	15; 36; 10



## N70.1 CHRONIC ADNEXITIS

**Adnexitis** - an inflammatory disease of the female reproductive organs (ovaries, fallopian tubes and the surrounding peritoneum). Accompanied by abdominal pain, tension and soreness of the lower portion of the abdominal wall, fever, frequent urination, pathological vaginal discharge, uterine bleeding.

### **Etiopathogenesis**

Non-specific (non-gonococcal) salpingoophoritis caused by pathogenic opportunistic agents. Among them: Staphylococcus golden, and Staphylococcus epidermidis, group B streptococci, enterococci, E. coli, etc., often the cause is mixed infection.

First, on the mucosa of the fallopian tubes (endo-salpink) there are all signs of inflammation: redness, microcirculation disorders, exudation, edema, cellular infiltration. Then, the inflammation extends to the muscular layer of the fallopian tube, appears edema. The tube thickens and lengthens, palpation becomes painful. Microbes from tube and its contents fall into the abdominal cavity, infect the serous cover of tube and surrounding peritoneum. Occurs perysalpingitis and pelvioperitonitis. After the rupture of the ovarian follicle pathogens fall, and infect granulose sheath of the follicle and inflammation occurs in the ovary (salpingo-oophoritis).

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	1,2; 9,4; 73	US - 2 intra-vaginally; 4-8 externally; MLT - 15 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-12.

Retreatment: after 1 month.

Patients with disease duration of 5 years are prescribed two courses, and with more than 5 years, and to all patients with obstruction of the fallopian tubes - 3 courses with 2 months intervals.

Possible combination with other treatments:

- EHF-puncture;
- laserpuncture;

- Drug therapy;
- Herbal medicine;
- Homeopathy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 19 (the projection of the ovaries);

- Area 20 (the projection of the fallopian tubes).

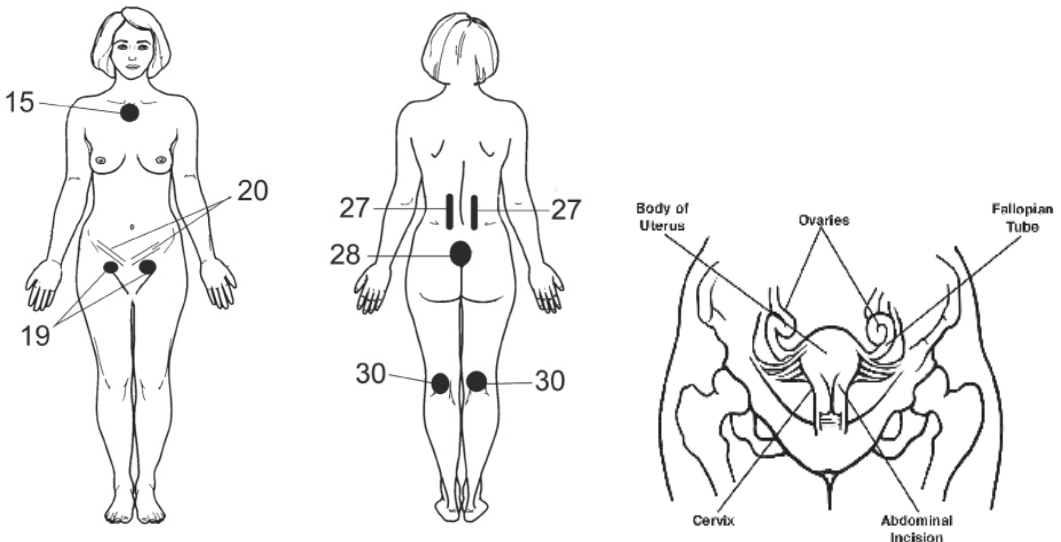
MLT Rd - Zone 30 (popliteal fossa);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 28 (diamond Michaelis);

- Area 27 (paravertebrally projection D11-L1 segmental innervation of the kidney).

Influence zones		
US	MLT IR	MLT Rd
19; 20	27; 28;	15; 30



## N71 ENDOMETRITIS

**Endometritis** is inflammation of the endometrium, the inner lining of the uterus.

### **Etiopathogenesis**

Endometritis arises when pathogens enter into the uterus. Infection can occur ascending, hematogenous and lymphogenous ways. Often it develops after birth, abortion. Accompanied by abdominal pain, tension and soreness of the lower portion of the abdominal wall, fever, general malaise, vaginal discharge.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	2,5; 3,5; 4,9; 9,4; 57	US - 5-7 totally. MLT - 15 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 5-10.

Retreatment: after 1 month.

Possible combination with other treatments:

- EHF-puncture;
- laserpuncture;
- Drug therapy;
- Herbal medicine;
- Homeopathy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - ZL - locus area (pelvic organs, on the area parallel hypogastriums occlusive disease, over the symphysis pubis).

- Area 20 (the projection of the fallopian tubes).

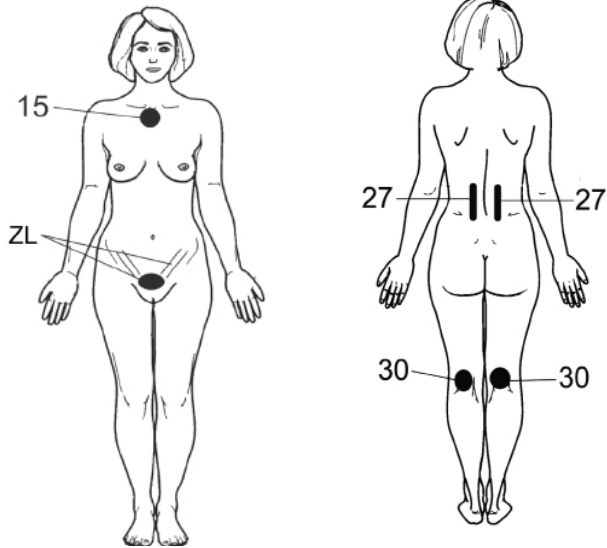


MLT Rd - Zone 30 (popliteal fossa)

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D10-L1 segmental innervation of the uterus).

Influence zones		
US	MLT IR	MLT Rd
ZL	27	15; 30



## N94 ALGOMENORRHEA

**Algomenorheya** (algomenorrhea, dysmenorrhea) - a cyclical disease process, manifested by pain in the abdomen during menstruation days, accompanied by a complex psycho-emotional and metabolic-endocrine symptoms.

Algomenoreya I - primary (spasmodic) - pain is not associated with organic diseases of the reproductive system and explain the pathogenesis of the hypothalamic-pituitary-ovarian system dysfunction and violation of the synthesis of prostaglandins.

Algomenoreya II - secondary (organic) - pains occur against the background of the etiologically associated gynecological diseases.

### **Etiopathogenesis**

As a result of the hypothalamic-pituitary-ovarian system dysfunction is disturbed the balance of estrogen and progesterone, causing absolute or relative hyperestrogenia. Estrogens stimulate the production of prostaglandins and oxytocin vasoactive substances. Increased secretion and release of prostaglandins in the cavity of the uterus during menstruation - the most convincing explanation for raising abnormal uterine activity, her contractions during menstruation, resulting in ischemia of its tissue, irritation of the nerve endings, increase their sensitivity and increased perception of pain.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	4; 4,9; 9,5	US - 6-8 totally. MLT - 15 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 5-10.

Retreatment: 1 month later.

Possible combination with other treatments:

- EHF-puncture;
- laserpuncture;
- Drug therapy;

- Herbal medicine;
- Homeopathy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

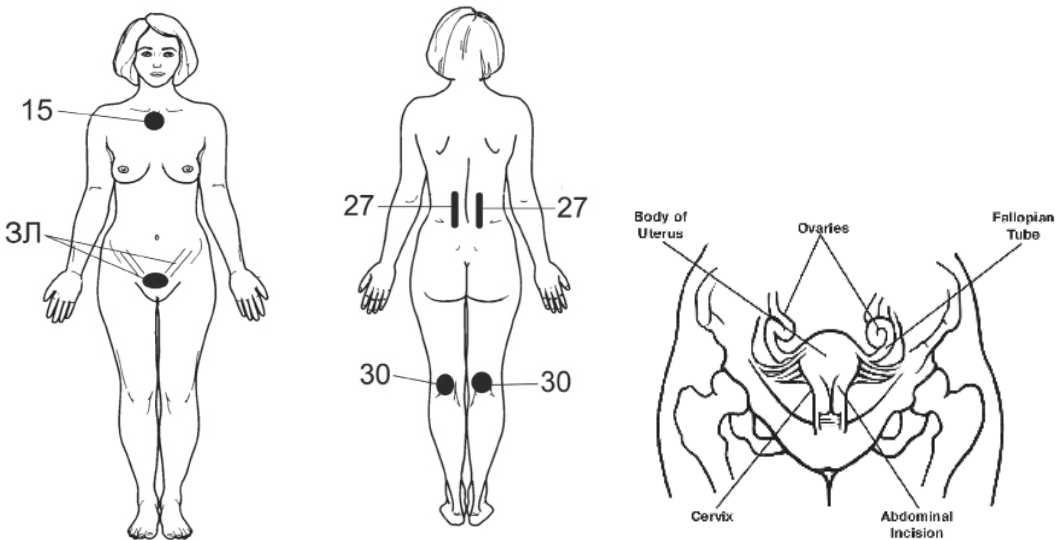
UST - ZL - locus area (pelvic organs, on the poupart ligaments, over the symphysis pubis).

- Area 20 (the projection of the fallopian tubes).

MLT the Rd - Zone 30 (popliteal fossa) - Zone 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D10-L1 segmental innervation of the uterus).

Influence zones		
US	MLT IR	MLT Rd
ZL	27	15; 30



## N91.0- N91.1 AMENORRHEA

**Amenorrhea** is the absence of a menstrual period in a woman of reproductive age for the period of 6 months or longer.

### **Etiopathogenesis**

Amenorrhea is often caused by hormonal disturbances from the hypothalamus and the pituitary gland, from premature menopause or intrauterine scar formation. It is defined as the absence of menses for three months in a woman with previously normal menstruation or nine months for women with a history of oligomenorrhoea.

The most common causes of primary amenorrhea - congenital diseases (Turner syndrome, gonadal dysgenesis, CNS tumors).

The most common causes of secondary amenorrhea: body mass deficit or morbid obesity, polycystic ovary syndrome, decompensated endocrine diseases.

The development of ovarian requires two sex X-chromosomes, i.e. female karyotype - 46 XX. During meiotic division of germ cells may occur abnormal set of sex chromosomes. At the confluence of these germ cells abnormal number of chromosomes gets in the fertilized egg. As a result of the wrong morphology and function the ovaries can not produce sex steroids.

### **TREATMENT SCHEME:**

Ont the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	20	US - 45 seconds on point MLT - 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 5-10.

Retreatment: a month later.

Possible combination with other treatments:

- Drug therapy;
- Herbal medicine;
- Homeopathy.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

RECOMMENDED RECIPE of SONO-puncture:

For ultrasonic puncture the point waveguide is used.

1) V23 (2) + VC3 + E28 (2) + F3 (2);

2) V32 (2) + VC6 + VB26 (2) + RP6 (2);

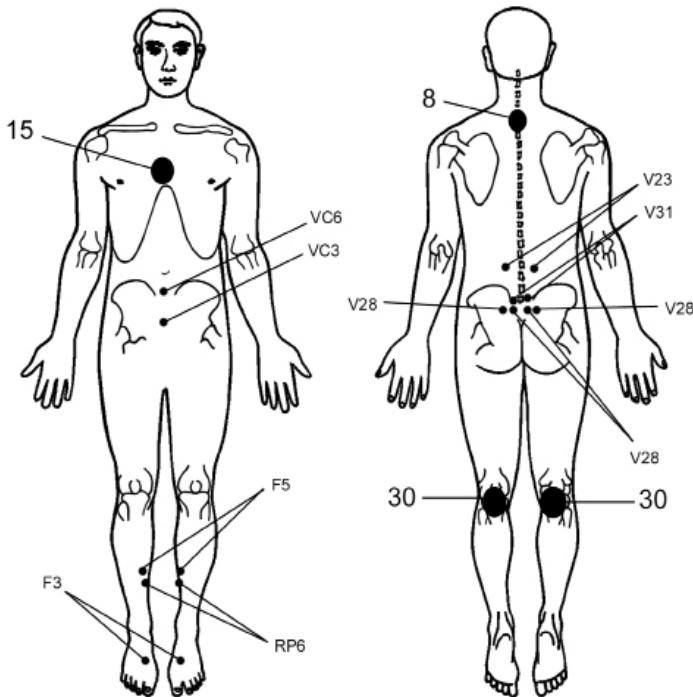
3) VC3 + VC6 + F3 (2) + RP6 (2).

MLT Rd - Zone 30 (popliteal fossa);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 8 (C8-D2 projection of the vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
Acupuncture points	8	15; 30



## N73 INFLAMMATORY DISEASES OF THE PERITONEUM AND TISSUES OF THE SMALL PELVIS

**Parametritis** is an inflammation of the uterus surrounding tissue. Occurs when infection spreads from the uterus after childbirth, abortion, curettage of uterine lining, operations on the cervix, using the IUD. The infection enters the parametrial tissue by limfogenic way. The disease begins with the appearance of infiltration and the formation of serous inflammatory exudate in the site of the lesion. At congenial course the infiltrate and exudate is absorbed, but in some cases in the place of inflammation the fibrous connective tissue develops, which leads to uterine displacement toward lession side. When there is a purulent exudate festering, parameter can be resolved by pus discharge in the rectum, rare - into the bladder or abdominal cavity.

MLUST is prescribed in the chronic stage.

### TREATMENT SCHEME:

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	75-99	4; 4,9; 99	UST - 2-5 totally MLT - 10 totally

### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 7-10.

Retreatment: When disease duration of more than 5 years spend up to 3 treatments with an interval of two months. Begins immediately after menstruation (5-7 day cycle).

Possible combination with other treatments:

- EHF-puncture; laserpuncture;
- Drug therapy;
- Herbal medicine;
- Homeopathy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel). Perhaps the use of phonophoresis of hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors mounted on the

projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

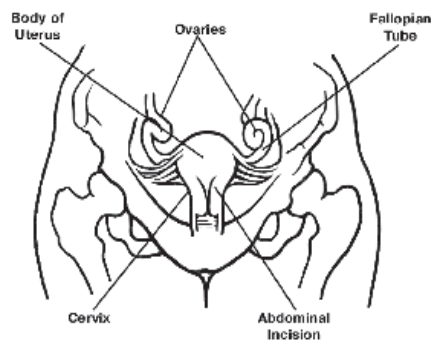
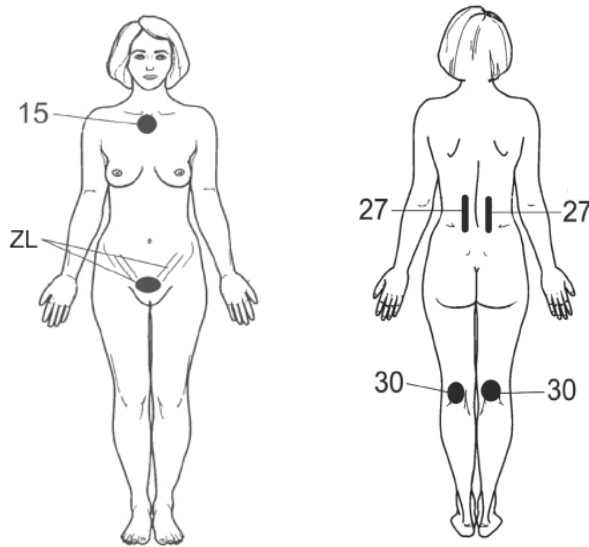
US - ZL - locus area (pelvic organs, adhesions projection).

MLT Rd - Zone 30 (popliteal fossa);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D10-L1 segmental innervation of the uterus).

Influence zones		
US	MLT IR	MLT Rd
ZL	27	15; 30



## N86 CERVICAL EROSION

**Cervical erosion** - a superficial ulceration of the mucous membrane of the vaginal portion of the cervix. It occurs usually on a background of cervicitis under the influence of irritating vaginal discharge. It may be a long time. Proceeds virtually asymptomatic.

### **Etiopathogenesis**

Wide-spread concept of the etiological role of inflammatory diseases, particularly endocervicitis which accompanied by increased secretion of cervical mucosa. Less essential have abnormal discharge from the uterus. Under the influence of long-term abnormal discharge, the surface epithelium from the vaginal portion of the cervix is exposed to maceration, dystrophy followed by desquamation. The surface of the true erosion is populated by micro-organisms coming from the canal of the cervix and vagina.

Theory of dishormonal origin of this disease suggests that the main role is played by an imbalance of sex steroid hormones. To support this theory there are observations of the emergence of erosion during pregnancy and regress after delivery, when returns hormonal homeostasis.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	9,4	UST - 1-2 on zone; to 5 totally MLT - 15 totally.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 5-10.

Retreatment: when needed, in a month.

Possible combination with other treatments:

- EHF-puncture;
- Drug therapy;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Possible is the introduction of a special nozzle into the vagina and the impact by the fixed method.



Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

US - ZL - locus area (cervical projection or intracervical scoring).

MLT Rd - Zone 30 (popliteal fossa)

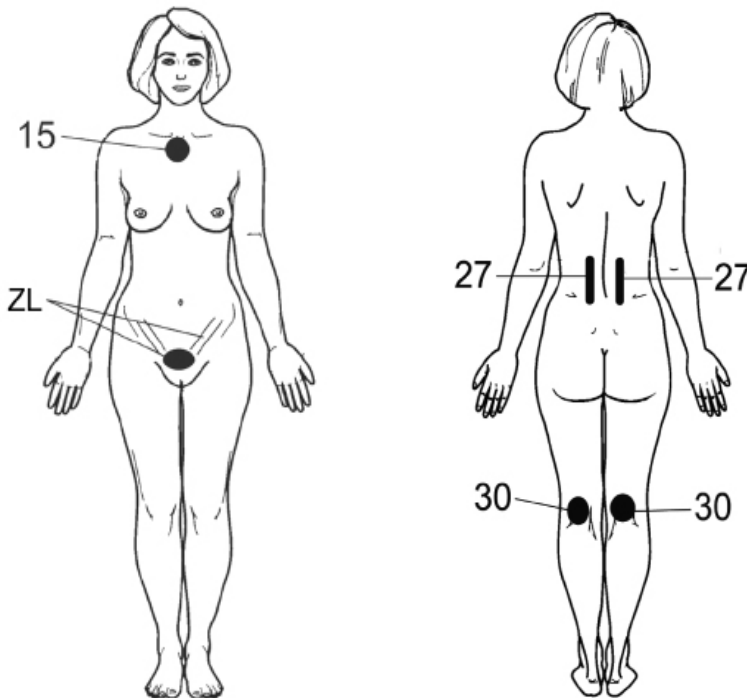
- Area 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D10-L1 segmental innervation of the uterus).

**ATTENTION!**

*Possible is also a special laser therapy with intravaginal intracavitary gynecological magneto-infrared laser head.*

Influence zones		
US	MLT IR	MLT Rd
ZL	27	15; 30



## N90.5 KRAUROSIS OF THE VULVA

**Kraurosis vulvae** is a disease of the vulva, which is expressed in dystrophic, atrophic and sclerotic changes in its skin. Usually it is combined with leukoplakia observed in menopause.

### **Etiopathogenesis**

Kraurosis vulva appears as an inadequate reaction of the surface layers of stratified squamous epithelium on various external and internal factors. Kraurosis vulva is provoked by available neuroendocrine disorders: hypofunction of the adrenal cortex, ovary, thyroid, bioelectric activity disorders of the cerebral cortex. Significant role in pathogenesis of vulvae kraurosis plays chronic inflammation, including long persistent HPV infection, HSV. Not excluded is the immunopathological mechanism of development of degenerative changes in kraurosis vulva. Women with kraurosis vulva, as a rule, are obese, diabetic, disregard the rules of personal hygiene.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	50-75	1,6; 1,8	UST - 3-6 totally; MLT - 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 5-10.

Retreatment: when needed in 1 month.

Possible combination with other treatments:

- Drug therapy;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel). In most cases apply phonophoresis of hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

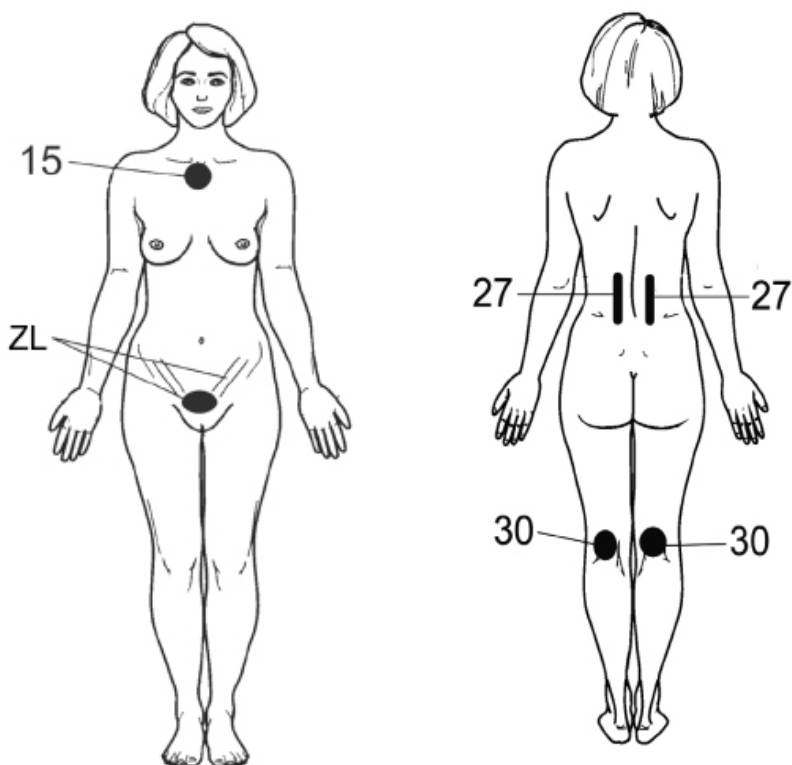
KM - ZL - locus area (labia, clitoris, pomezhnost).

MLT Rd - Zone 30 (popliteal fossa);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D10-L1 segmental innervation of the uterus).

Influence zones		
US	MLT IR	MLT Rd
ZL	27	15; 30



## N89 VAGINAL DISCHARGE

**Vaginal discharge** from the genitals that cause or do not cause (pathological leucorrhoea) the irritation of the skin and mucous membranes of the external genitalia.

### **Etiopathogenesis**

The most common causes are inflammatory diseases of external and internal genitalia (60-70%) due to *Gardnerella vaginalis*, *Trichomonas vaginalis*, fungi of *Candida* genus, by associations of opportunistic aerobic and anaerobic bacteria, or HSV and HPV.

The optimal condition of the vagina microecosystem depends on complex chemical and biological protective factors: formation in the vaginal epithelium of sufficient amount of glycogen, balanced process of enzymatic digestion, maintaining a certain concentration of hydrogen ions and the normal microflora, the full functioning of the ovaries. Change in any of these factors, individually or collectively violate the delicate balance within the system, which entails the adaptive or maladaptive changes, clinical manifestation of which often become abnormal discharge from the genital tract.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	77-99	1,6; 1,8	US - 1,5 at a point MLT - 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Methods of exposure: still on AP (acupuncture points).

Frequency of treatments: daily or every other day.

Number of treatments: 5-10.

Retreatment: when needed, in 1 month.

Possible combination with other treatments:

- Drug therapy;

- Phytotherapy.

Methods of exposure: labile and stable in the recommended areas.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - acupuncture points.

Recommended recipe:

PC48 (2) + HC140 (2) + F2 (2)

V27 (2) + PC150 (2) + F3 (2)

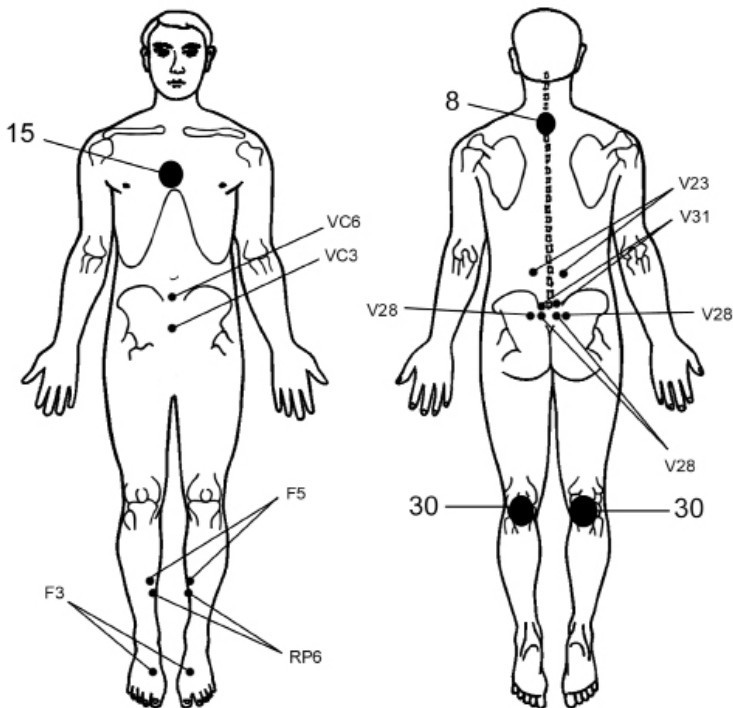
PC48 (2) + PC140 (2) + F8 (2)

MLT Rd - Zone 30 (popliteal fossa);

- Area 15 (the projection of the thymus gland).

MLT IR - Zone 8 (C8-D2 projection of the vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
AP	8	15; 30



## N97 INFERTILITY

ML UST is prescribed for tubal infertility.

### **Etiopathogenesis**

Causes of female infertility: the psychosexual disorders, hyperprolactinemia, pituitary level lesions (tumor), amenorrhea with high levels of FSH, amenorrhea, irregular menstruation and / or anovulation, congenital malformations, bilateral obstruction of tubes, adhesive process in small pelvis, endometriosis, acquired uterine and cervical pathology, acquired tubal pathology, acquired ovarian pathology; unexplained infertility, systemic diseases.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-4	75-99	1; 6,2; 72; 95	UST - 5 totally; MLT - 15 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10-15.

Re-treatment: 2 courses carried out with an interval of two months.

Possible combination with other treatments:

It is advisable to combine with hydro-tubation.

- Drug therapy;

- Herbal medicine;

- Psychological correction.

Methods of exposure: labile and stable in the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug cocoa butter or other plants, ultrasound gel).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

US - ZL - Zone locus (pelvic organs; hypogastriums area parallel occlusive disease;

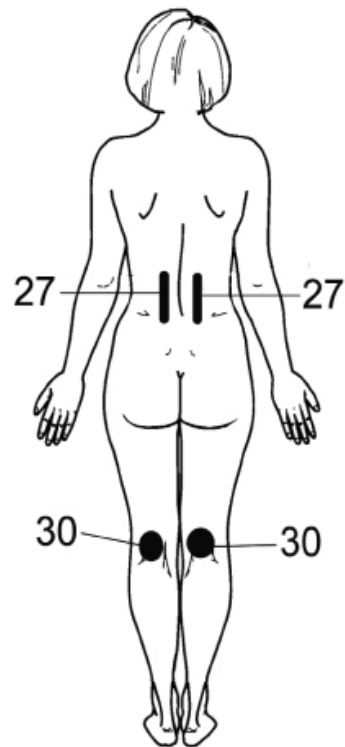
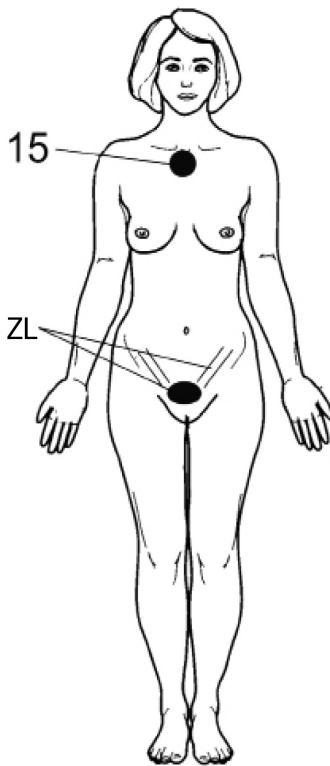
over the symphysis pubis).

MLT Rd - Zone 30 (popliteal fossa)

- Zone 15 (the projection of the thymus gland).

MLT IR - Zone 27 (paravertebrally projection D10-L1 segmental innervation of the uterus).

Influence zones		
US	MLT IR	MLT Rd
ZL	27	15; 30



## O12- O14- O15 GESTATIONAL TOXICOSIS (GESTOSES)

Gestational toxicosis include a number of pathological conditions that occur during pregnancy, complicating its course, and tend to disappear after its completion.

### **Etiopathogenesis**

A lot of speculation expressed about the causes of early gestational toxicosis. Particular attention is paid to the study of the pathogenesis of vomiting during pregnancy. Vomiting of pregnant (and excessive vomiting) is associated with poisoning organism by toxic products of metabolism, disruption of the endocrine glands, it is believed that vomiting as a result of sensitization has much in common with allergic reactions. Due to the changes that occur in nervous system, the body's physiological processes of adaptation to pregnancy is not carried out. A significant development was the hormonal theory of toxicosis of pregnant. The reason for their appearance, some authors considered the impaired function of the adrenal cortex, other – the change in secretion of estrogen hormones, and others - hormonal insufficiency of the placenta.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	12-15	10	US - 2-5 on every side MLT - 10 totally

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Exposure to ultrasound is performed through the contact medium (drug cocoa butter or other plants, ultrasound gel).

Frequency of treatments: daily.

Number of treatments: 10-15.

Retreatment: when needed in 1 month.

Possible combination with other treatments:

- Herbal medicine;

- Psychological correction.

Methods of exposure: labile and stable on the recommended areas.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.



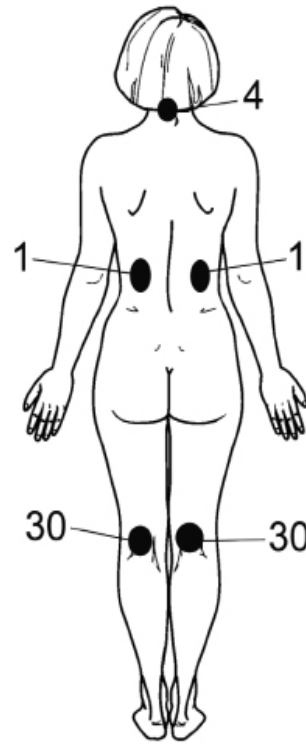
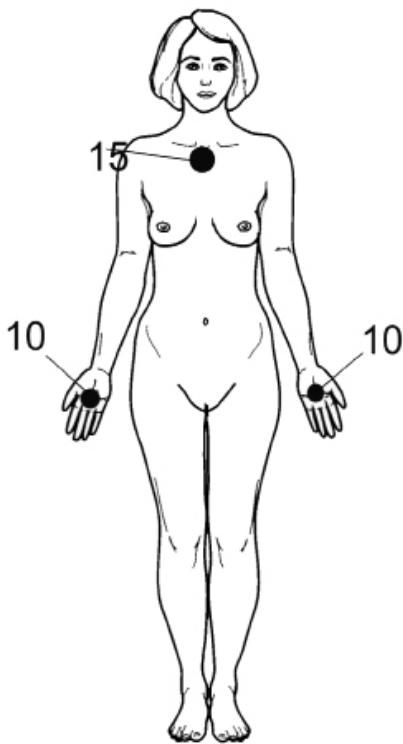
UST - Zone 1 (kidney projection).

MLT Rd - Zone 10 (palmar surface of the hand on the right / left) - Zone 4 (zone of the medulla oblongata);

MLT IR - Zone 15 (the projection of the thymus gland);

- Area 30 (popliteal fossa).

Influence zones		
US	MLT IR	MLT Rd
1	15; 30	4; 10



## 00-I99 DISEASES OF THE CIRCULATORY SYSTEM

### I10 HYPERTENSIVE HEART DISEASE

**Hypertensive heart disease** - persistent increase in blood pressure above the boundaries of the physiological norm (140/90 mm Hg.) in patients who are not receiving antihypertensive therapy.

#### **Etiopathogenesis**

The basis of this disease is high voltage (increased tone) of the walls of small arteries (arterioles) of the body, which leads to their narrowing and reduction of their lumen. This hampers the movement of blood from one portion of the vascular system (artery) into another (the vein), resulting in pressure on the arterial wall increases.

Stage I: 140-159 mm Hg. - Systolic; 90-99 mm Hg. for diastolic.

Stage II: 160-179 mm Hg. . - Systolic; 100-109 mm Hg. for diastolic.

Stage III:  $\geq 180$  mm Hg. . - Systolic;  $\geq 110$  mm Hg. for diastolic.

#### **TREATMENT SCHEME:**

The front panel of the device are the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	3,3; 9,4; 6; 9,2; 9,5; 65; 96	UST – totally to 3; MLT – totally not more 10.

#### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Drug therapy;
- Herbal medicine;
- EHF-puncture;
- Psychological correction.

Methods of exposure: labile and stable on the recommended areas.

The UST is carried out with drug-phonophoresis of 1% solution of analgetic or a mixture of dipyrone with a 1% solution of hydrocortisone or a mixture of rum dipyrone and mud (40 ml per 100 g of body weight).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 24 (paravertebrally, D 1-6 segmental innervation area of the heart).

MLT Rd - Zone 12 (over- and subclavian area);

- Area 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left).

MLT IR - Zone 21 (the projection of the celiac plexus);

- Zona17 (liver projection)

- Area 31 (the projection of the tibial artery on the right / left);

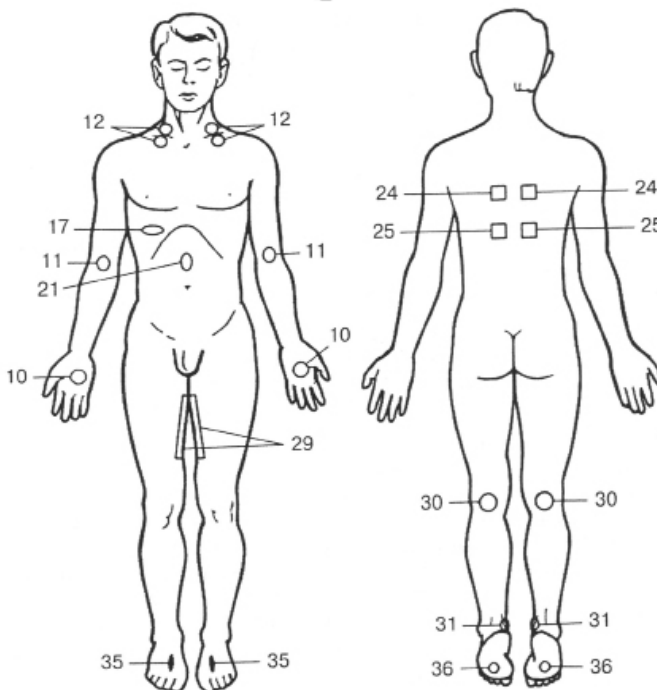
- Area 35 (the projection of the dorsal artery of the foot);

- Area 29 (the projection of the femoral artery).

**ATTENTION!**

*For the impact of MLT Rd and MLT IR use 2-3 zone (of the proposed) in one session.*

Influence zones		
US	MLT IR	MLT Rd
24	17; 21; 10; 29; 35; 31; 36	12; 11; 30



## I22 MYOCARDIAL INFARCTION

**Myocardial infarction** is a necrosis of individual sections of the heart muscle on the basis of acute ischemia resulting from non-compliance of the coronary circulation of the myocardium requests.

### **Etiopathogenesis**

Risk factors: hypercholesterolemia and hypertriglyceridemia, or rather, the presence of primarily type II and IV hyperlipidemia with a high content of beta-atherogenic and prebeta lipoproteins, reduction of antiatherogenic  $\alpha$ -lipoproteins in blood, glucose intolerance, elevated levels of ar-globulins, signs of blood hypercoagulable and suppression of fibrinolysis, left ventricular hypertrophy, atherosclerosis, with its preclinical and clinical manifestations, hypercholesterolemic xanthomatosis, age over 40 years (especially in men), family history (the presence of myocardial infarction in the immediate family), limited physical activity, hypertension, diabetes, obesity, smoking, psycho-emotional stress and stressful situations. For immediate risk factors for heart attack include angina. High risk factor for myocardial infarction is a myocardial infarction melkoochagovyy relating to the intermediate forms of ischemic heart disease and to the true state preinfarction as 20-30% of cases

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	9-12	43; 95	US - 10. MLT - 15.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: 3-4 times a week.

Number of treatments: 12.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Drug therapy;
- Herbal medicine;
- EHF-puncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed through the contact medium (drug, cocoa butter or other plants, ultrasound gel). In most cases, carried out phonophoresis of «Venoruton» ointments (Switzerland), «Troxevasin» (Bulgaria), «Nitromaz» (Finland).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 12 (over-and subclavian area).

MLT R - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left).

MLT IR - Zone 24 (paravertebrally, D 1-6 segmental innervation area of the heart);

- Area 21 (the projection of the celiac plexus);

- Zona17 (liver projection);

- Area 31 (the projection of the tibial artery on the right / left);

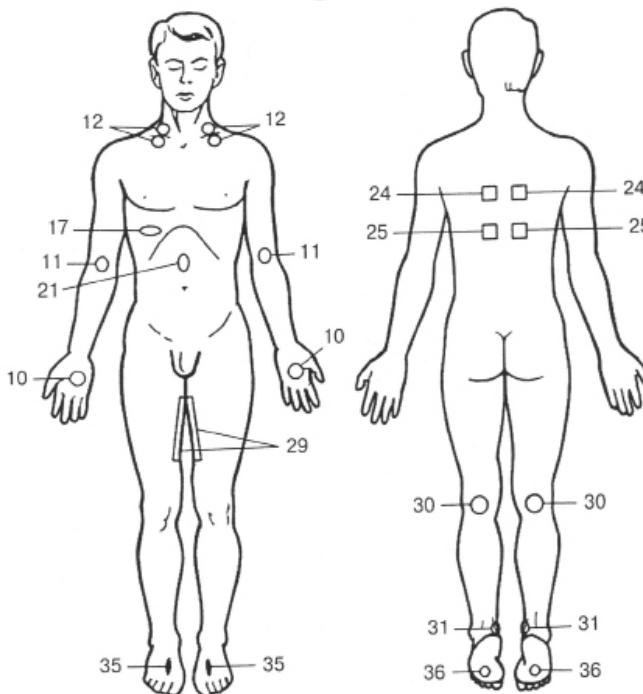
- Area 35 (the projection of the dorsal artery of the foot);

- Area 29 (the projection of the femoral artery).

**ATTENTION!**

**For the impact of MLT Rd and MLT IR use 2-3 zone (of the proposed) in one session.**

Influence zones		
US	MLT IR	MLT Rd
12	24; 25; 17; 21; 10; 29; 35; 31; 36	11; 30



## I49 EXTRASYSTOLE (OPTION 1)

**Extrasystole** is the most common kind of arrhythmia. Depending on the location of occurrence of arrhythmia is divided into atrial, ventricular and atrioventricular.

### **Etiopathogenesis**

The reason of arrhythmias may be different intoxications: endogenous, the main importance has the hyperthyroidism, and exogenous - digitalis intoxication, taking diuretics (potassium depletion of the body), aminophylline, insulin, as well as the use of strong tea or coffee, excessive smoking.

The immediate cause of arrhythmia is the increase of excitability of the heart muscle in any of its point. This is possible with the weakening of the automatism of the sinus node, in violation of the sinus impulse propagation in any portion of the myocardium as a result of focal lesions, in connection with which the independent excitation pulse outbreak occurs. Beats may occur in many parts of myocardium and therefore has a different clinical significance.

Pathogenetic basis of it is the increase of the automaticity of individual sections of the myocardium, and the possible mechanism of re-entry, as well as trigger mechanism.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	6	US - 2 min on local AP; 1 min on distal AP; MLT - totally up to 15.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: 3-4 times a week.

Number of treatments: 12.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Drug therapy;
- Herbal medicine;
- EHF-puncture.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly on the BAT.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - acupuncture points.

Recommended recipe:

1) P1 (2) + MS 5 (2);

2) V15 (2) + C7 (2).

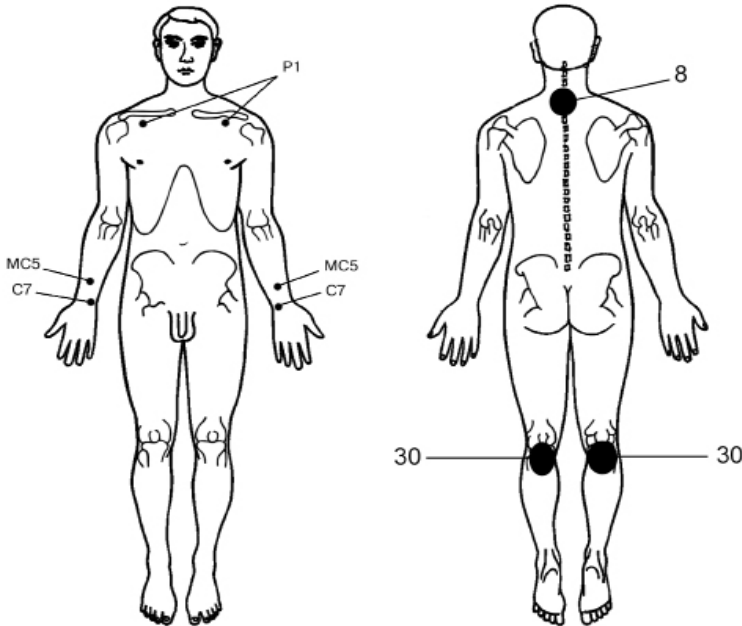
MLT Rd - Zone 30 (popliteal fossa on the right / left).

MLT IR - Zone 8 (C8 projection D2 vertebral segments).

**ATTENTION!**

***For the impact of MLT Rd and MLT IR use 2-3 zone (of the proposed) in one session.***

Influence zones		
US	MLT IR	MLT Rd
BAP	8	30



## I49 EXTRASYSTOLE (OPTION 2)

### TREATMENT SCHEME:

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	9-12	6	UST – up to 5 on zone, 15 totally. MLT – up to 10 on zone, 25 totally.

### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: 1-2 days.

Number of treatments: 10-15.

Re-treatment: in 3-4 months.

Possible combination with other treatments:

- Drug therapy;
- Diet therapy;
- Physical therapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly or via the contact medium (ultrasound gel medicament cocoa butter or other plants).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 17 (the projection of the liver)

- Area 24 (paravertebrally, D2-6 segmentarnyya innervation of the heart)
- Area 25 (the projection of the liver and gall bladder).

MLT Rd - Zone 30 (popliteal fossa on the right / left)

- Area 10 (palmar surface of hands)
- Area 12 (over-and subclavian area)
- Area 11 (ulnar fossa).

MLT IR - Zone 21 (the projection of the celiac plexus)

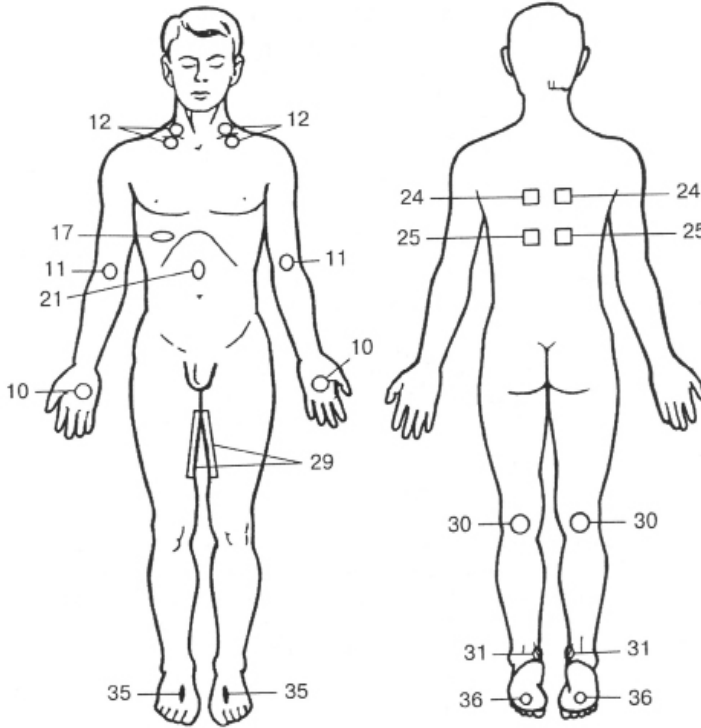
- Area 29 (the projection of the femoral vessels)
- Area 31 (the projection of the tibial artery)
- Area 35 (the projection of the dorsal artery of the foot).



**ATTENTION!**

*During one session use the same area for UST and 2 areas (of the proposed) for MLT Rd and MLT IR. All zones alternate in independence of the affected vessel.*

Influence zones		
US	MLT IR	MLT Rd
24; 25; 17	21; 29; 31; 35	10; 11; 30; 12



## E10-E14 DIABETES

**Diabetes** (diabetes, sugar diabetes, diabetes mellitus) - a chronic endocrine-metabolic and vascular disease, which is based on absolute or relative deficiency of insulin, leading to disruption of carbohydrate, fat, protein and another types of exchanges, as well as functions of major organs and body systems.

### **Etiopathogenesis**

Diabetes is a multifactorial disease with genetic predisposition. Risk factors for developing type 2 diabetes include: obesity, ethnicity (especially when changing the traditional way of life to the West); sedentary lifestyle; especially diet (high intake of refined carbohydrates and low fiber content); arterial hypertension. Pathogenetically T2D is a heterogeneous group of metabolic disorders, this is what determines its significant clinical heterogeneity. At the heart of it lies the pathogenesis of insulin resistance (decreased insulin-mediated glucose utilization by tissues), which is implemented on the background of the secretory dysfunction of  $\beta$ -cells. Thus, there is a violation of the balance sensitivity to insulin and insulin secretion. Secretory  $\beta$ -cell dysfunction is decelerating of 'early' release of insulin secretory response to an increase in blood glucose levels. At the same time the 1st (rapid) phase of secretion, which is the emptying of vesicles accumulated insulin, is virtually absent; 2-I (slow) phase of secretion is carried out permanently in response to stabilized hyperglycemia, in tonic regime, and despite the excess secretion of insulin, blood glucose levels on a background of insulin resistance are not normal.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	75-99	2,4 (zone 17) 9,4 rest zones	UST – not more than 15 totally. MLT – totally up to 25.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: the first week - every other day; the second - after 2 days; third - 2 times a week.

Number of treatments: up to 20 sessions.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly or via the contact medium (ultrasound gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

Day 1:

UST - zone 19a, 19b (the projection of the pancreas front and rear);

MLT Rd - zone 36 on the right (the plantar surface of the foot).

MLT IR - Zone 36 on the left (the plantar surface of the foot).

The intensity of exposure - 25%, exposure time - 3 minutes per zone.

Day 2:

UST - Zone 17 (the sixth intercostal space on the right, the liver projection).

The intensity of exposure - 50%, exposure time - 3 minutes per zone.

MLT Rd - Zone 36 (the plantar surface of the foot).

The intensity of exposure - 50%, exposure time - 4 minutes per zone.

MLT IR (in alternation with the US) - Zone 26 (paravertebrally, left / right on the D10-11 vertebral level).

The intensity of exposure - 75%, exposure time - 7 minutes per zone.

Day 3:

UST - zone 19a, 19b (the projection of the pancreas front and rear).

The intensity of exposure - 75%, exposure time - 5 minutes per zone.

MLT IR - zone 37, 38 (additional area).

The intensity of exposure - 100%, exposure time - 7 minutes per zone.

Day 4:

UST - Zone 17 (the sixth intercostal space on the right, the liver projection).

The intensity of exposure - 100%, exposure time - 7 minutes per zone.

MLT Rd - Zone 36 (the plantar surface of the foot).

The intensity of exposure - 100%, exposure time - 10 minutes per zone.

MLT IR - Zone 37 (additional area).

The intensity of exposure - 100%, exposure time - 10 minutes per zone.

Day 5:

UST - zone 19a, 19b (the projection of the pancreas front and rear).

The intensity of exposure - 100%, exposure time - 7 minutes per zone.

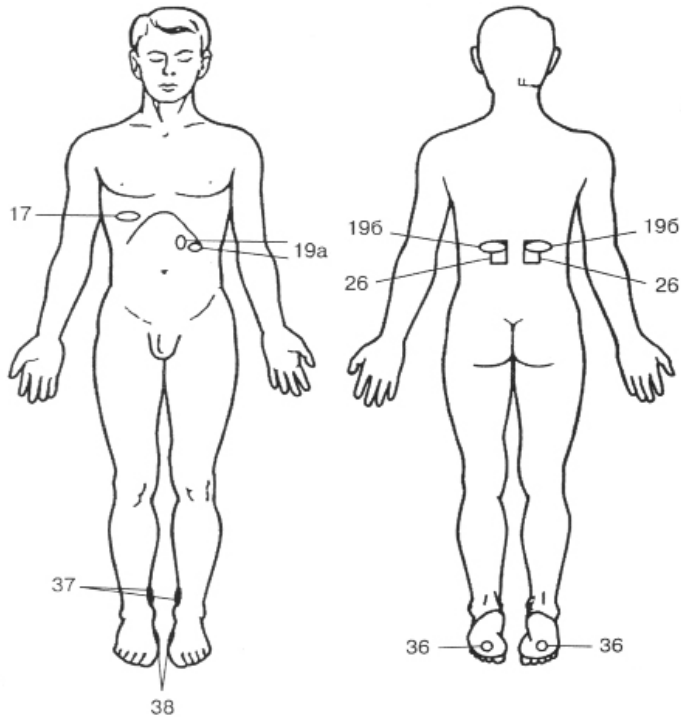
MLT Rd - Zone 36 (the plantar surface of the foot).

The intensity of exposure - 100%, exposure time - 15 minutes per zone.

MLT IR - Zone 37 (additional area).

The intensity of exposure - 100%, exposure time - 15 minutes per zone.

Influence zones		
US	MLT IR	MLT Rd
17; 19a; 196	26; 37; 38	36



## I20-I25 CORONARY HEART DISEASE

**The coronary heart disease** (CHD) includes several self-addressed forms of heart disease: angina pectoris, focal degeneration, myocardial infarction.

### **Etiopathogenesis**

The basis of coronary heart disease is always a coronary insufficiency, caused by atherosclerosis of the heart coronary arteries. CHD contribute to many internal and external factors, called risk factors: lipid metabolism, is usually characterized by high blood cholesterol, hypertension, diabetes, smoking, physical inactivity, prolonged emotional stress.

The basis of the pathogenesis of myocardial ischemia in all forms of coronary heart disease is a mismatch between the demand of the heart muscle for oxygen and nutrients, and their reception because of narrowing of the coronary arteries. Of great importance in the pathogenesis of coronary insufficiency in ischemic heart disease have impaired platelet function and increase blood clotting, which can impair the microcirculation in the capillaries of the myocardium and lead to thrombosis of the

arteries, which contribute to atherosclerotic changes in their walls and the slowing of blood flow in areas of narrowing of the arteries.

**TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	1,2 (zones 8; 14); 37 (zone 24); 1-10 (zones 17; 25); 9,4 (zones 19, 26).	US – not more than 15 totally; MLT - totally to 25.

**METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: the first week - every other day; the second - after 2 days; third - 2 times a week.

Number of treatments: 15.

Re-treatment: 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Phytotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly or via the contact medium (ultrasound gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

Day 1:

UST - Zone 19 (the projection of the pancreas);

- Area 26 (paravertebrally, left / right on the D10-11 vertebral level).

MLT Rd - Zone 8 (C8 projection D2 vertebral segments).

MLT IR - Zone 14 (apical region of the heart push);

The intensity of exposure - 25%, exposure time - 3 minutes per zone.

Day 2:

UST - Zone 17 (the sixth intercostal space on the right side, the liver projection).

MLT Rd - Zone 25 (projection C8 D2 vertebral segments).

MLT IR - Zone 14 (apical region of the heart push).

The intensity of the impact of 50%, exposure time - 3 minutes per zone.

Day 3:

US - Zone 19 (the projection of the pancreas).

MLT Rd - Zone 8 (C8 projection D2 vertebral segments).

MLT IR - Zone 14 (apical region of the heart push).

The intensity of exposure - 75%, exposure time - 3 minutes per zone.

Day 4:

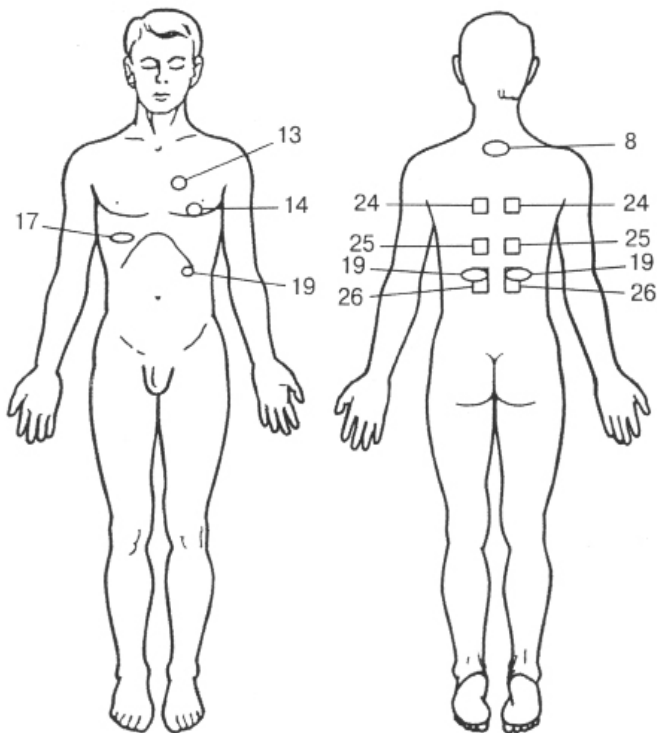
UST - Zone 17 (the sixth intercostal space on the right, the liver projection).

MLT Rd - Zone 25 (projection C8 D2 vertebral segments).

MLT IR - Zone 14 (apical region of the heart push).

The intensity of exposure - 100%, exposure time - 3 minutes per zone.

Influence zones		
US	MLT IR	MLT Rd
17; 19; 26	14; 24	8; 25



### E06.3 AUTOIMMUNE THYROIDITIS

**Autoimmune thyroiditis** is a heterogeneous group of inflammatory diseases of the thyroid autoimmune etiology, in pathogenesis of which is a different expression of the destruction of follicles and follicular thyroid cells.

#### **Etiopathogenesis**

The disease develops on the background of the genetically determined defect of the immune response, resulting in T-lymphocytic aggression against its own thyrocyte and

their destruction. Pathological significance for the body of autoimmune thyroiditis is almost the fact that it is a risk factor for hypothyroidism. The fact of thyroid antibodies carriage, which are the markers of autoimmune thyroiditis, multiple greater than the incidence of hypothyroidism in the population, suggests that in most cases the disease does not result in hypothyroidism.

**TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	50-75	9,4 (zones TG, 15, 20) 1-10 regeem P1 (other zones)	UST – not more 15 totally. MLT - totally to 25.

**METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: the first week - every other day; the second - after 2 days; third - 2 times a week. Possible are supporting MLUST sessions; 1 session in a week or two weeks depending on the efficacy of treatment.

Number of treatments: 20.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Spa treatment.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly or via the contact medium (ultrasound gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

Day 1:

MLT Rd - Zone 1 (the parietal protuberance, projection area of the pineal gland, AT - T20).

MLT IR - Zone 15 (the projection of the thymus gland, the sternum at the level of the 4th intercostal space);

- Zone 8 (C7-D2 projection of the vertebral segments).

The intensity of exposure - 25%, exposure time - 3 minutes per zone.

Day 2:

UST - Zone 20 (the projection of the spleen, the area of the left hypochondrium).

The intensity of exposure - 50%, the total exposure time - 3 min.

MLT Rd - Zone 3 (eye - effect through closed eyelids).

The intensity of exposure - 50%, exposure time - 5 minutes per zone.

MLT IR - Zone 10 (palmar surface of hands right / left).

The intensity of the impact of 75%, exposure time - 7 minutes per zone.

Day 3:

UST - Zone 19 (the projection of the pancreas);

- Area 15 (the projection of the thymus gland, the sternum at the level of the 4th intercostal space);

The intensity of exposure - 75%, exposure time - 7 minutes.

MLT Rd - Zone 1 (the parietal protuberance, projection area of the pineal gland, AT - T20);

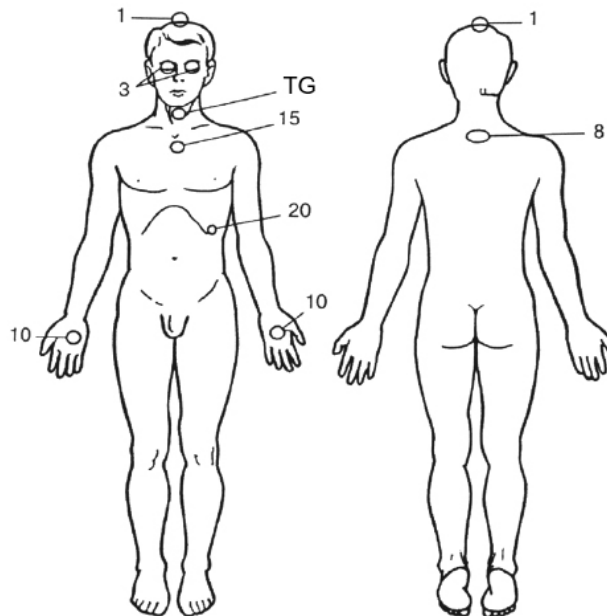
- Zone 8 (C8 projection D2 vertebral segments).

The intensity of exposure - 75% , exposure time - 5 minutes per zone.

MLT IR - Zone 10 (palmar surface of hands right / left).

The intensity of the impact of 75%, exposure time - 10 minutes per zone.

Influence zones		
US	MLT IR	MLT Rd
20	10; 15	1; 3; 8





## I63 ISCHEMIC STROKE

**Stroke (attack).** This term unites the states of different etiology and pathogenesis of the state, which implementing link is an acute vascular accident of the arterial and venous bed. The stroke includes acute cerebral circulatory disorders, which are characterized by a sudden (within minutes, at least - hours) emergence of focal neurological disorders (motor, speech, sensory, coordinates, visual, cortical functions, memory) and / or brain disorders (change of consciousness, headache , vomiting, etc.) that persist for more than 24 hours, or lead to death of the patient in a shorter period of time due to the causes of cerebrovascular origin.

### **Etiopathogenesis**

The main causes of intracerebral hemorrhage are hypertension, intracranial aneurysm (including microaneurysms, formed as a result of a traumatic brain injury or sepsis), arteriovenous malformation, cerebral amyloid angiopathy, the use of anticoagulants or thrombolytics, diseases accompanied by hemorrhagic syndrome (leukemias, uremia, thrombocytopenic purpura disease, etc.).

The most two common types of ischemic stroke (cerebral infarction) are thrombotic due to primary thrombotic occlusion of a cerebral vessel, and embolic, due to embolism from a remote source.

The most effective is the use of developed techniques in the first 2 weeks of illness.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5	6-15	37 (Ischemic hearth) 1-10 Mode P1 (rest area)	UST - no more than 15 in total. MLT - totally up to 25

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: the first 3-4 days - 2 times a day, then 1 treatment per day up to 12 days after stroke.

Number of treatments: 10-15.

Retreatment:

Possible combination with other treatments:

- Medical treatment including antioxidant therapy;
- Electrostimulation of paretic limbs after 5 days of the disease;

- Special laying of the patient and possible elements of passive and active physical therapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly or via the contact medium (ultrasound gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

1st session (morning):

MLT Rd - Zone 6a (projection of the carotid artery on ischemia side).

The intensity of exposure - 25%, exposure time - 10 minutes per zone.

MLT IR - Zone 1a (projection of ischemia focus, transcranial);

The intensity of exposure - 50%, exposure time - 7 minutes per zone.

2nd session (evening):

MLT IR - Zone 1a (projection focus ischemia, transcranial)

The intensity of exposure - 75%, exposure time - 10 minutes per zone.

- Zone 8 (C8-D2 vertebral segments projection).

The intensity of exposure - 50%, exposure time - 7 minutes per zone.

3rd session (morning):

MLT IR - Zone 1a (projection of ischemia focus, transcranial);

The intensity of exposure - 100%, exposure time - 10 minutes per zone.

MLT Rd - Zone 6a (projection of the carotid artery on ischemia side).

The intensity of exposure - 50%, exposure time - 10 minutes per zone.

4th session (evening)

MLT IR - Zone 1a (projection focus ischemia, transcranial)

The intensity of exposure - 100%, exposure time - 10 minutes per zone.

- Zone 8 (C8-D2 vertebral segments projection).

The intensity of exposure - 75%, exposure time - 7 minutes per zone.

MLT Rd - 6b area (the projection of the carotid artery on the opposite side of ischemia).

The intensity of exposure - 50%, exposure time - 10 minutes per zone.

5th session (morning):

MLT IR - Zone 1a (projection of ischemia focus, transcranial).

The intensity of exposure - 100%, exposure time - 10 minutes per zone.

MLT Rd - Zone 6a (projection of the carotid artery by the side of ischemia).

The intensity of exposure - 50%, exposure time - 10 minutes per zone.

UST - Zone 17 (the projection of the liver).

The intensity of exposure - 100%, exposure time - 7 minutes per zone.

6th session (evening):

MLT IR - Zone 1a (projection of ischemia focus, transcranial).

The intensity of exposure - 100%, exposure time - 10 minutes per zone.

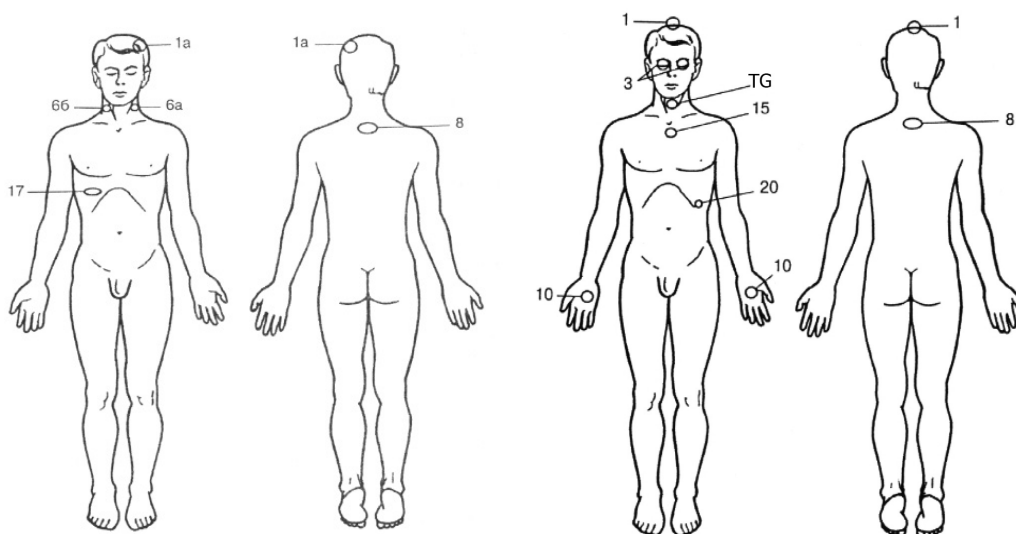
- Zone 8 (C8-D2 vertebral segments projection).

The intensity of exposure - 100%, exposure time - 7 minutes per zone.

MLT Rd - zone 6b (the projection of the carotid artery on the opposite side of ischemia).

The intensity of exposure - 50%, exposure time - 10 minutes per zone.

Influence zones		
US	MLT IR	MLT Rd
17	1a; 8	6a; 6b



Methods of MLT in acute ischemia in the basin of vertebral arteries are similar to that during ischemia in the basin of the carotid arteries.

The only difference is that for the percutaneous laser irradiation of blood is selected the projection of the vertebral arteries (under the occipital bone, paravertebrally). Time and exposure parameters, as well as monitoring of treatment efficacy are similar.

Influence zones		
US	MLT IR	MLT Rd
20	10; 15	1; 3; 8

## G43 MIGRAINE

### Etiopathogenesis

Migraine is a disease characterized by paroxysmal repetitive headache from 4 to 72 hours, often accompanied by visual and gastrointestinal symptoms.

Migraine attacks are accompanied by regional changes in cerebral blood flow due to the expansion of intracranial arteries. Vasomotor changes are caused by sporadic decrease systemic serotonin concentration. Prodromal symptoms may be due to intracranial vasoconstriction. One of the main factors of migraine is a constitutional predisposition to it, which is often hereditary. According to the vascular theory, migraine is treated as suddenly developing generalized breakdown of the vasomotor regulation, which is manifested by tone lability of cerebral and peripheral vascular disease.

### TREATMENT SCHEME:

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	12-15	37; 75; 77	US - totally up to 10. MLT - totally not more than 15.

### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily during the acute (pain) period, each other day in between attacks.

Number of treatments: up to 14-15.

Retreatment: in case of need in two weeks.

Possible combination with other treatments:

- Drug therapy;
- Physical therapy;
- Acupuncture.

Methods of exposure: labile and stable on the recommended areas.

UST is conducted directly or via a coupling medium (ultrasound gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 17 (the projection of the liver);

- Area 21 (the projection of the celiac plexus);
- Area 25 (the projection of the liver and gall bladder).

MLT Rd - Zone 6 (projection of the carotid artery);

- Area 10 (palmar surface of the right / left).

MLT IR - PPL (possible pain localization);

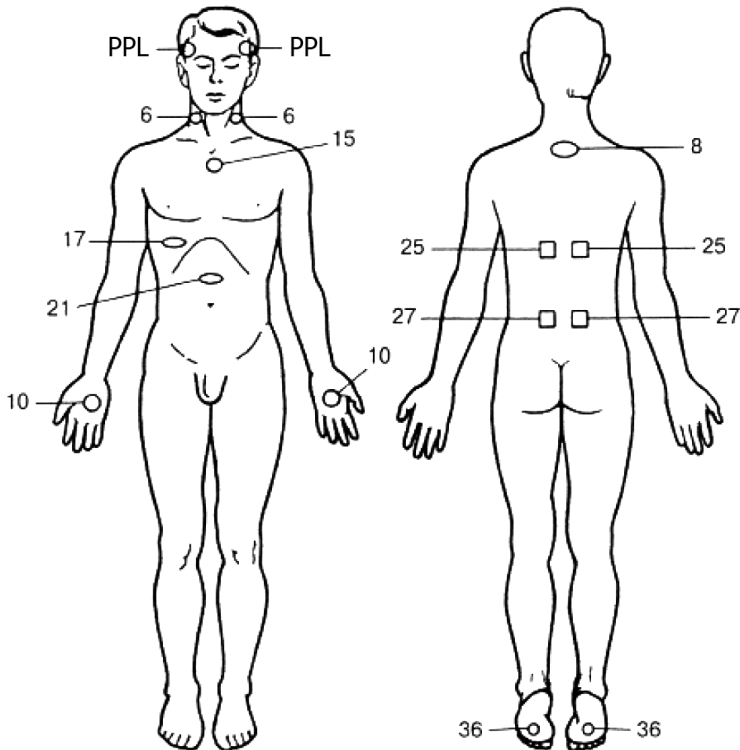
- Zone 8 (C8-D2 vertebral segments projection).

Additional area: US (27); MLT IR (36).

**ATTENTION!**

***For the impact of MLT Rd and MLT IR use 2-3 zone (of the proposed) in one session.***

Influence zones		
US	MLT IR	MLT Rd
17; 21; 25; 27	PPL; 8; 36	6; 10



## N00-H59 DISEASES OF THE EYE AND ADNEXA

### H47.0 OPTIC NERVE SUBATROPHY

#### H35 RETINITIS PIGMENTOSA

**Optic nerve subatrophy** is a disease of the optic nerve and retina. It develops most often as a result of craniocerebral injury, cerebral vascular disease, or arachnoiditis. It is characterized by a decrease of visual functions and pallor of the optic disc.

#### **Etiopathogenesis**

Causes: various pathological processes in the optic nerve and the retina (inflammation, degeneration, swelling, poor circulation, compression of the optic nerve damage), diseases of the central nervous system (brain tumors, abscesses, meningitis, syphilitic lesions), hypertension, atherosclerosis, profuse bleeding, intoxication, hereditary reasons.

Pathogenesis: the destruction of nerve fibers and their replacement by glial connective tissue, obliteration of capillaries that feed the optic nerve.

#### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5, encreasing with each session, maximum on the 5th session	50-75-99 growing with each session, maximum on the 5th session	1-5th sessions - 1-10 (P 1) 6-7 th sessions - 9.4 8-9 th sessions - 18 10-11 minutes sessions - 37 12-15 minutes sessions - 75 16-21 minutes 10-100 sessions (P2)	US - up to 7. MLT - not more than 10 per zone.

#### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: first 5 sessions daily, the following 5 - each other day, then 3 sessions per week.

Number of treatments: 21.

Re-treatment: in two or three months.

Possible combination with other treatments:

- Drug therapy;
- Super-electrophoresis (endonasal technique) of hydrocortisone or vitamin E

Methods of exposure: labile and stable on the recommended areas.

UST is conducted directly or via a contact medium (UST gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

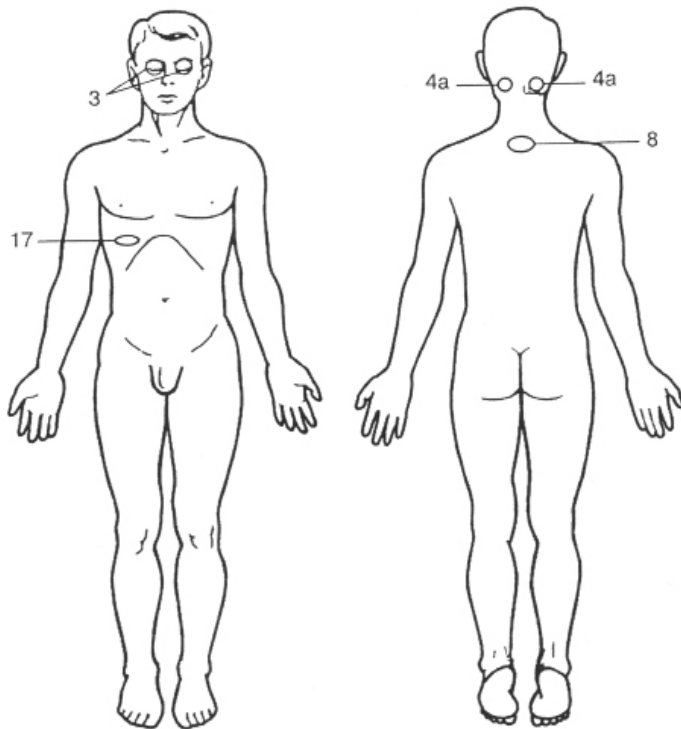
UST - Zone 17 (the projection of the liver).

MLT Rd - Zone 3 (eye exposure through closed eyelids).

MLT IR - 4a (the projection of the occipital lobe of the brain)

- Zone 8 (C8 projection D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
17	8; 4a	3



## H00-H59 MYOPIA

**Near-sightedness, also known as short-sightedness and myopia,** is a condition of the eye where light focuses in front of, instead of on, the retina. This causes distant objects to be blurry while close objects appear normal. Other symptoms may include headaches and eye strain. Severe near-sightedness increases the risk of retinal detachment, cataracts, and glaucoma.

### **Etiopathogenesis**

It is now recognized that in the origin of myopia play a role a combination of following factors: genetic (polygenic nature of inheritance, often in an autosomal recessive manner), and environmental factors. The impact of the latter may appear as in utero (toxoplasmosis, rubella, toxicosis of pregnant women, as often are the cause of prematurity), and in the postnatal period (acute and chronic infections, especially accompanied by hyperthermia of prolonged course, weight loss, lack of proteins and food, heavy physical and intensive visual work).

In the pathogenesis of progressive myopia and its complications a role plays not only abnormal elongation of the eyes, but the increase of its dimensions (horizontal, vertical, oblique) and volume respectively. In this region of the equator and rear pole of the eyes in different patients are involved in the pathological process in varying degrees, which leads to damage of various departments of the fundus.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5 increasing with each session, maximum on the 5th session	50-75-99 increasing with each session, maximum on the 5th session	1-10 (P1) alternated with 37 each other session	UST - up to 7. MLT - not more than 10 per zone.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: the first 2-3 sessions each other day, the following - 2 sessions per week.

Number of treatments: 14-15.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Special exercises for the eye muscles;



- electrostimulation of circular eye muscle on both sides;
- Acupuncture.

Methods of exposure: labile and stable on the recommended areas.

UST is conducted directly or via a contact medium (UST gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

US - Zone 17 (the projection of the liver).

MLT Rd - Zone 3 (eye exposure through closed eyelids).

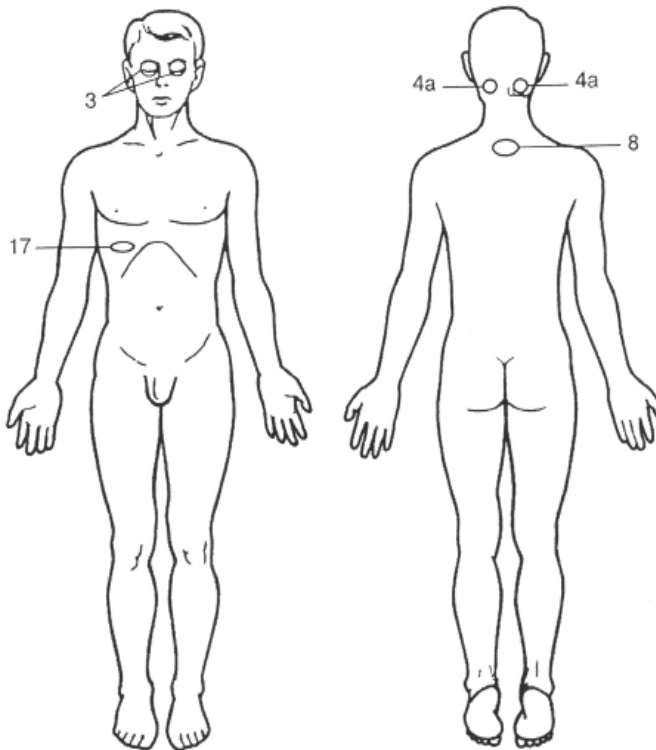
MLT IR - 4a (the projection of the occipital lobe of the brain)

- Zone 8 (C8-D2 vertebral segments projection).

**ATTENTION!**

**Sessions are favorable to carry out in the morning (10-12 a.m.).**

Influence zones		
US	MLT IR	MLT Rd
17	8; 4a	3



## H 36.0 DIABETIC RETINOPATHY

This form of microangiopathy is highlighted in a separate complication of diabetes due to the large, not only medical, but also social value (impact on the quality of life of patients and their ability to work).

### **Etiopathogenesis**

The primary factor that plays a role in the development of diabetic retinopathy is hyperglycemia. Other metabolic disturbances which occur in diabetes to a lesser extent affect the development of microangiopathy of the retinal vessels.

The first link in the pathogenesis of this case is the failure of retinal vascular wall by the type of microangiopathy in diabetes mellitus. Vascular lesion leads to a decrease in blood perfusion of the retina, leading to the development of chronic hypoxia. In turn, chronic hypoxia causes the development of dystrophies, fatty degeneration or calcification are often develop in the retina. In addition, chronic hypoxia stimulates the vascular neogenesis of compensatory character in terms of hypoxia. Neovascularization occurs due to proliferation of cell wall elements of existing vessels.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5 encreasing with each session, maximum in the 5th session	50-75-99 growing with each session, maximum the 5th session	1-10 (P1) alternated with 37 each other session	US - to 7. MLT - not more than 10 per zone.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: the first 2-3 sessions each other day, the following - 2 sessions per week.

Number of treatments: 20-21 (usually 14-15).

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Diet therapy;
- Electrophoresis of potassium iodide solution by Bourguignon or endonasal metod.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed directly or via the contact medium (UST gel, Vaseline, medicament).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

1st session:

UST - Zone 17 (the projection of the liver).

MLT Rd - Zone 3 (eye exposure through closed eyelids).

MLT IR - 25 (the projection of the liver and gall bladder).

The intensity of exposure - 25%, exposure time per zone - 3 minutes.

2nd session:

UST - Zone 19 (the projection of the pancreas).

MLT Rd - Zone 3 (eye exposure through closed eyelids);

- Zone 4a (projection of the occipital lobe of the brain).

MLT IR - 26 (paravertebrally, the projection of segmental innervation of the pancreas, D10-12).

The intensity of exposure - 50%, exposure time per zone - 4 minutes.

3rd session:

MLT Rd - Zone 6 (percutaneous irradiation of blood, the projection of the carotid arteries).

The intensity of exposure - 50%, exposure time to the zone - 10 minutes.

MLT IR - Zone 8 (C8-D2 vertebral segments projection).

The intensity of exposure - 75%, exposure time per zone - 5 minutes.

4th session:

MLT Rd - Zone 3 (eye exposure through closed eyelids);

- Zone 4a (projection of the occipital lobe of the brain).

The intensity of exposure - 50%, exposure time per zone - 5 minutes.

UST - Zone 17 (front projection of the liver).

MLT IR - Zone 25 (paravertebrally, D7-L2 segmental innervation zone of the liver).

The intensity of exposure - 75%, exposure time per zone - 5 minutes.

5th session:

UST - Zone 19 (the projection of the pancreas).

MLT IR - zone 4a (projection of the occipital lobe of the brain).

- Area 26 (paravertebrally, the projection of the pancreas segmental innervation, D10-12).

The intensity of exposure - 100%, the exposure time per zone - 7 minutes.

6th session:

MLT Rd - Zone 6 (percutaneous irradiation of blood, the projection of the carotid arteries).

The intensity of exposure - 50%, exposure time to the zone - 15 minutes.

7th session:

MLT Rd - Zone 3 (eye exposure through closed eyelids);

- Zone 4a (projection of the occipital lobe of the brain).

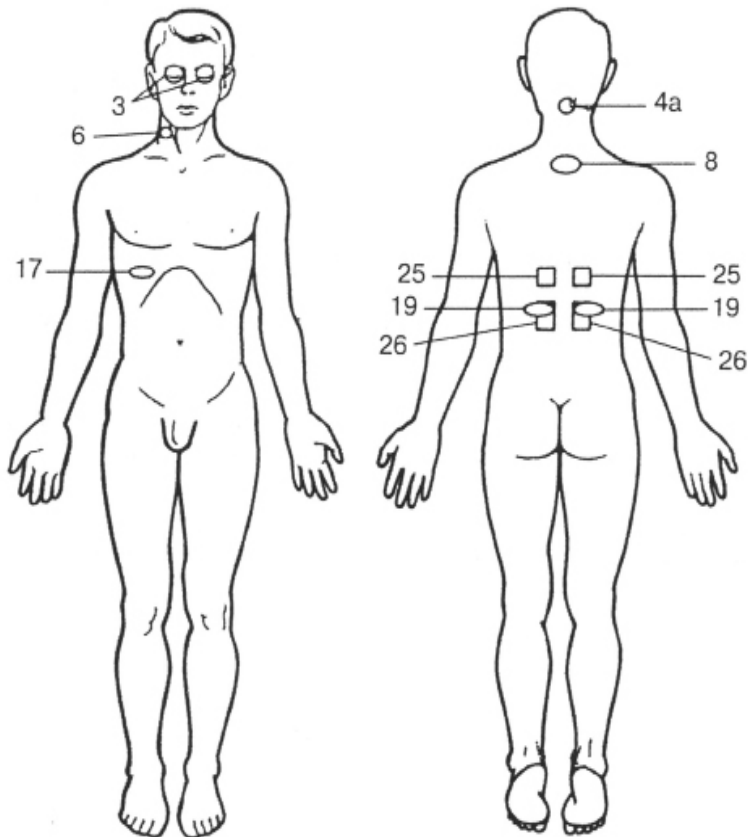
The intensity of exposure - 50%, exposure time to the zone - 10 minutes.

UST - Zone 17 (front projection of the liver).

MLT IR - Zone 25 (paravertebrally, D7-L2 segmental innervation zone of the liver).

The intensity of exposure - 100%, the exposure time per zone - 7 minutes.

Influence zones		
US	MLT IR	MLT Rd
17; 19; 26	8; 4a; 25; 26	3; 4a; 6



## L00-L99 DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE

### L40 PSORIASIS

**Psoriasis** is a long-lasting autoimmune disease which is characterized by patches of abnormal skin. Affects the skin, hair and sebaceous glands. The disease has a multifactorial nature. Occurs at any age, non-communicable.

#### TREATMENT SCHEME:

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3	75-99	2,5	UST - on the focus 3, total up to 10. MLT - 5 at the center, total of 20.

#### METHOD OF TREATMENT

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10-15.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Drug therapy;
- Herbal medicine;
- EHF-puncture;

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed via the contact medium - refined sunflower oil. As a medicament for phonophoresis is use hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - ZL area (zone of lesions);

- Area 17 (the projection of the liver).

When multiple foci affect the segmental zone paravertebrally by ultrasound with a frequency of 100 kHz.

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);
- Area 20 (the projection of the spleen);
- Area 12 (over- and subclavian area).

Use 1-2 zone in one session.

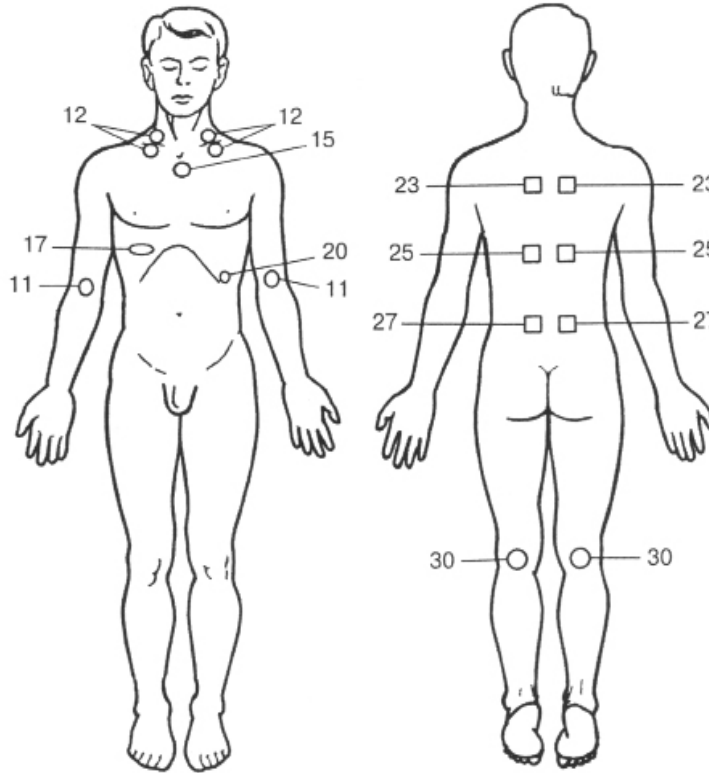
MLT IR - Zone 23 (paravertebrally, D 2-5 segmental innervation zone of the lung);  
 - Area 25 (paravertebrally, D7 - L2 segmental innervation zone of the liver);  
 - Area 27 (paravertebrally, D11 - L2 segmental innervation area of the kidneys).

Possible combinations of treatment zones.

Day 1 - ZL (US); 12; 30 (MLT Rd); 23, 25, 27 (MLT IR).

Day 2 - 17 (US); 11, 20 (MLT Rd); ZL (MLT IR), etc.

Influence zones		
US	MLT IR	MLT Rd
ZL; 17	23; 25; 27; 15	11; 30; 12; 20



## L43 RED FLAT LICHEN

**Lichen red flat** is a skin disease that affects the skin, mucous membranes and less nails.

### **Etiopathogenesis**

At the heart of the development of lichen planus are violations of the regulation of immune and metabolic processes leading to inadequate tissue response under the influence of endogenous and exogenous trigger factors. It is established the family predisposition of lichen planus with autosomal dominant inheritance. There are different theories of the disease: neural, viral and toxic-allergic. Well-known are cases of lichen planus after stress, effective hypnosis and reflex-segmental therapy, indicating the role of the nervous system in the pathogenesis of the disease. The toxic-allergic version of the development of isolated lichen planus on the mucous membrane of the mouth is of great importance. Occurrence of the lichen planus on the oral mucosa to some extent depends on the presence of disease in patients with gastrointestinal (gastritis, colitis etc.) and liver and pancreas diseases.

The most common theory is the infectious (probably viral) and neurogenic origin of the disease. Suffer mostly adults.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	1,2; 1,5; 52; 75	UST - total of 6-10. MLT - 3 per zone total to 20.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 7-12.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Drug therapy;
- Diadynamic;
- Electro-sleep.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed via the contact medium - refined sunflower oil. As a medicament for ultraphonophoresis can use hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on

the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 23, 25, 27 (paravertebrally, segmental zones of the lungs, liver, kidney);

- Area 17 (the projection of the liver).

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);

- Area 20 (the projection of the spleen);

- Area 12 (over- and subclavian area).

Use 1-2 zone in one session.

MLT IR - ZL (zone of lesions);

**ATTENTION!**

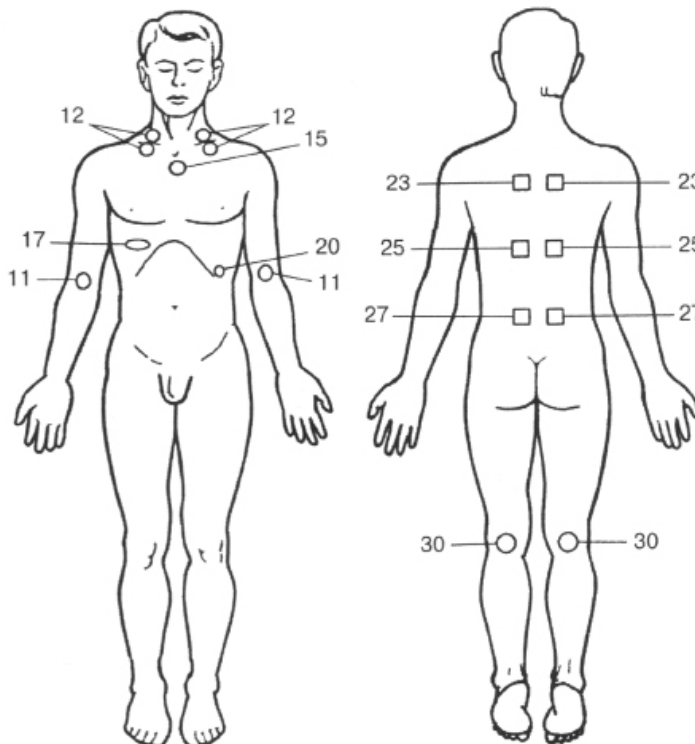
*At verrucous form of the disease the ultrasound is combined with MLT IR each other day, locally.*

Possible combinations of treatment zones.

Day 1 - 23, 25, 27 (UST); 12; 30 (MLT Rd); ZL (MLT IR).

Day 2 - 17 (UST); 11, 20 (MLT Rd); ZL (MLT IR), etc.

Influence zones		
US	MLT IR	MLT Rd
23; 25; 27; 17	ZL	11; 30; 12; 20





## L20-L30 DERMATITIS AND ECZEMA

**Dermatitis** is an inflammation of the superficial layers of the skin of neuro-allergic nature that occurs in response to external or internal stimuli, characterised by different polymorphic rash, itching and prolonged recurrent course.

### **Etiopathogenesis**

Eczeema is considered as a polyetiological disease. The weakness of the immune system in the presence of infectious antigenic stimuli is manifested by persistence of microbial and bacterial antigens and the formation of chronic recurrent inflammation in the epidermis and dermis. This gives rise to abnormal circulating immune complexes damaging own microstructures with formation of autoantigens series initiating formation of autoaggressive antibodies.

### **TREATMENT SCHEME: (ACUTE STAGE)**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	eczema, dermatitis - 0.7 acne vulgaris -1.7 pustular eczema, weakness, fatigue - 2.2 diastolic hypertension - 9.2	UST - 5 on each side MLT - 3 per zone, total to 20.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: every other day.

Number of treatments: 10-12.

Retreatment: if necessary, after 30 days.

Exposure to ultrasound is performed via the contact medium - refined sunflower oil. As a medicament for ultraphonophoresis can be used hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 23, 25, 27 (paravertebrally, segmental lung area, liver, kidney);

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);

- Area 20 (the projection of the spleen);

- Area 12 (over-and subclavian area).

Use 1-2 zone in one session.

MLT IR - ZL (Zone of lesion);

**TREATMENT SCHEME: (CHRONIC STAGE).**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3	75-99	Eczema, Dermatitis - 0.7 Eczema, dermatitis, abrasions, acne vulgaris -1.7 Eczema pustular, weakness, fatigue - 2.2 Eczema, diabetes, diastolic hypertension - 9.2	UST - 2 per zone, total of 6-10. MLT - 3 per zone, total up to 20.

**METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Retreatment: if necessary, after 30 days.

Possible combination with other treatments:

- Drug therapy;
- EHF-puncture;
- Intravenous blood irradiation;
- Psychological correction;
- Diet therapy.

Methods of exposure: labile and stable on the recommended areas.

UST is performed via the contact medium - refined sunflower oil.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - ZL (zone of lesion).

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);
- Area 20 (the projection of the spleen);
- Area 12 (over- and subclavian area).

Use 1-2 zone in one session.

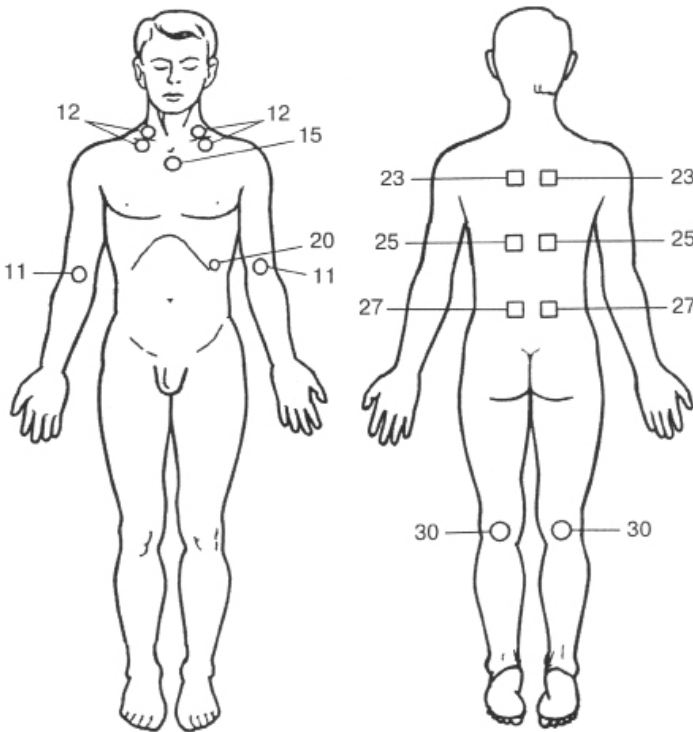
MLT IR - Zone 23, 25, 27 (paravertebrally, segmental lung area, liver, kidney);

**ACUTE STAGE**

Influence zones		
US	MLT IR	MLT Rd
23; 25; 27	ZL	11; 30; 12; 20

**CHRONIC STAGE**

Influence zones		
US	MLT IR	MLT Rd
ZL	23; 25; 27	11; 30; 12; 20



## **B00 B00 INFECTION CAUSED BY THE HERPES VIRUS (HERPES SIMPLEX)**

### **Pathogenesis**

The group of herpes viruses include 4 viruses of similar morphology: HSV (herpes simplex), varicella-zoster - virus, the causative agent of herpes zoster and varicella zoster virus; Epstein-Barr virus and cytomegalovirus. By the end of 18 months of life, almost everyone is in contact with HSV-1, the gateway typically is the respiratory tract. Then the virus enters the cells of the trigeminal ganglion, and throughout life can never cause the clinical manifestations of infection.

With HSV-2 the first contact usually occurs in early puberty with the start of sexual relations. At the same time after the external manifestations, which may not be the same, virus goes into an inactive form and in sacral ganglion cells is able to maintain for a long time.

### **TREATMENT SCHEME:**

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	9,4; 20; 40	UST - 4-5 in total; MLT - 3 per zone; total up to 15.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 2-3.

Retreatment: if necessary.

Possible combination with other treatments:

- Drug therapy.

Methods of exposure: labile and stable on the recommended areas.

UST is performed via the contact medium (anhydrous lanolin with peach butter).

As a medicament for ultraphonophoresis interferon ointment is used.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - ZL (zone of lesion);

- Area 17 (the projection of the liver).

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);

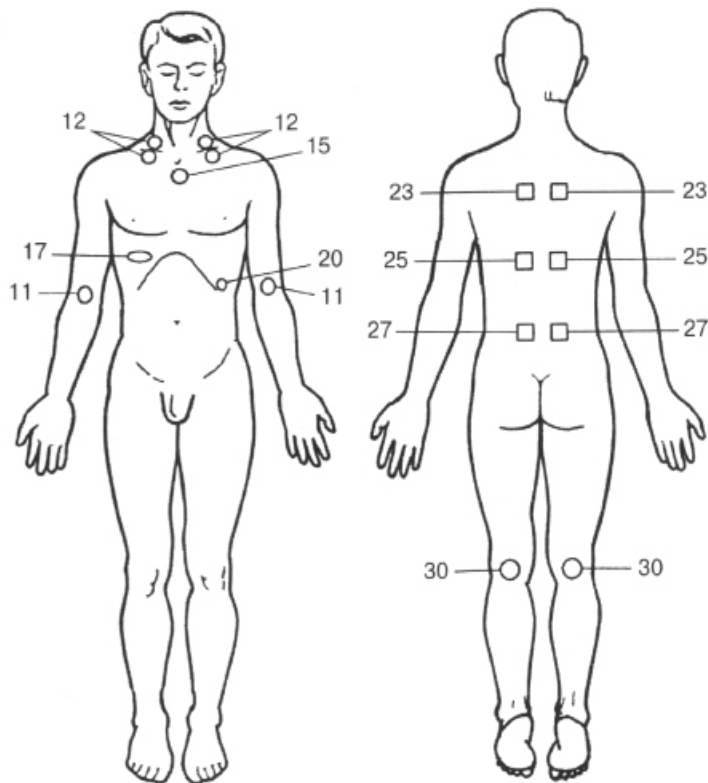
- Area 20 (the projection of the spleen);

- Area 12 (over- and subclavian area).

Use 1-2 zones in one session.

MLT IR - Zone 23, 25, 27 (paravertebrally, segmental lung area, liver, kidneys).

Influence zones		
US	MLT IR	MLT Rd
Affected area; 17	23; 25; 27	11; 30; 12; 20



## L20.8 NEURODERMATITIS

**Neurodermatitis** - a skin disease characterized by itching, lichenoid papules and chronic relapsing course. It has a clear seasonal dependence.

### **Etiopathogenesis**

Neurogenic theory of the origin of neurodermatitis gives a leading role in the genesis of the disease to violations of GNI, which is accompanied by discoordination of nervous processes, pathological changes in their strength, balance and mobility.

Allergic theory of the genesis of neurodermatitis gives priority to the body's hypersensitivity to certain food, drugs, chemicals.

Hereditary theory considers the etiology and pathogenesis of neurodermatitis in line with a genetic predisposition to atopy. For example, studies suggest that atopic dermatitis develops in 56-81% of people whose parents (one or both, respectively) also suffered from this disease.

Considering the above, it is likely to be thinking about neurogenic-allergic nature of neurodermatitis and its primary development in individuals with hereditary predisposition. The impetus for the beginning and progression of neurodermatitis can serve as psychogenic factors, intoxication, endogenous and exogenous stimuli (exacerbation of chronic infections, food, inhalation, contact with allergens, sun exposure, vaccination), endocrine disorders, etc.

Main pathogenetic changes at neurodermatitis relate to immune disorders, excessive production of vasoactive substances and violation of the regulation of vascular tone. Pathological changes in the skin at neurodermatitis represented by acanthosis, intercellular edema (spongiosis), hyperkeratosis, the presence of perivascular infiltrates in the dermis.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	1,7; 1,2	UST - 5-7 per side MLT - 5 per zone, total up to 25.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 10-12.

Re-treatment: in the case of relapse.

Possible combination with other treatments:

- Drug therapy;
- EHF-therapy;

- Diet therapy;
- A long climatotherapy.

Methods of exposure: labile and stable on the recommended areas.

UST is performed via the contact medium (anhydrous lanolin with peach butter).

As a medicament for ultraphonophoresis is used the interferon ointment.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 23, 25, 27 (paravertebrally, segmental lung area, liver, kidneys).

- Area 17 (the projection of the liver).

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);

- Area 20 (the projection of the spleen);

- Area 12 (over- and subclavian area);

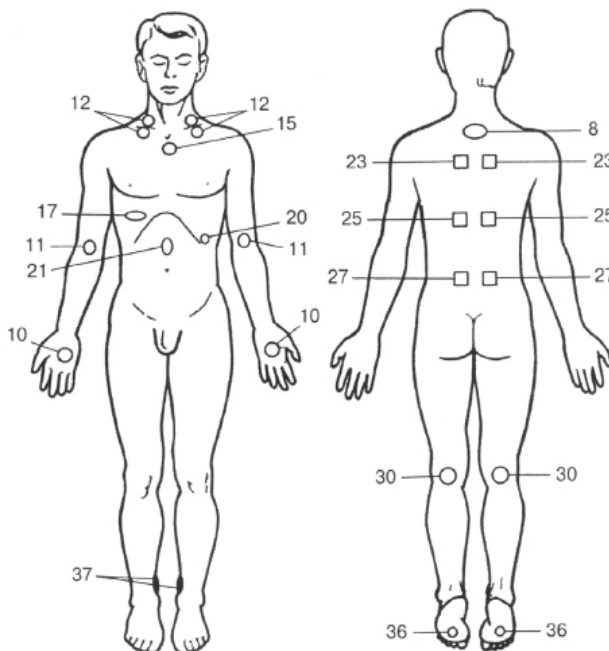
- Area 37 (the lower third of the internal surface of the tibia);

- Area 36 (the plantar surface of the foot).

Use 2-3 zone in one session.

MLT IR - ZL (zone of lesions).

Influence zones		
US	MLT IR	MLT Rd
23; 25; 27	ZL	11; 30; 12; 20; 36; 37



## L94.0 LOCALIZED SCLERODERMA

Scleroderma is a long term autoimmune disease that results in hardening of the skin. In the more severe form, it also affects internal organs. The underlying mechanism involves the body's immune system attacking healthy tissues. Environmental factors have also been implicated. Scleroderma is characterized by multifocal fibrous structural and morphological and functional pathological processes with severe chronic course and irreversible skin tightening centers, in which there is progressive fibrosis with arteriole's obliterative lesions.

### **Etiopathogenesis**

The etiology is unknown. By precipitating factors rank stressors, acute and chronic diseases, physical stimuli (cooling, sun exposure, vibration, ionizing radiation), chemicals (vaccines and serums). Pathogenesis of scleroderma is complicated, complex, with probability of a genetic conditions, but not yet precisely defined set of HLA genotypes. Scleroderma refers to multifactorial diseases with polygenic inheritance. In its pathogenesis a key role play the impaired functions of fibroblasts and other collagen-forming cells.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	75-99	37; 50	UST - 2.5-3 per zone not more than 10 in total; MLT - 5 per zone, total up to 55.

### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-8.

Re-treatment: in the case of relapse.

Possible combination with other treatments:

- Drug therapy;
- EHF-therapy;
- Diet therapy;
- A long climatotherapy.

Methods of exposure: labile and stable on the recommended areas.

Exposure to ultrasound is performed via the contact medium. As a medicament for ultraphonophoresis use lidaza, ronidaza, aloe, dimexide.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on



the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST- zones 23, 25, 27 (paravertebrally, segmental lung area, liver, kidneys).

- Area 17 (the projection of the liver).

MLT Rd - Zone 11 (ulnar fovea right / left);

- Area 30 (popliteal fossa on the right / left);

- Area 20 (the projection of the spleen);

- Area 12 (over- and subclavian area);

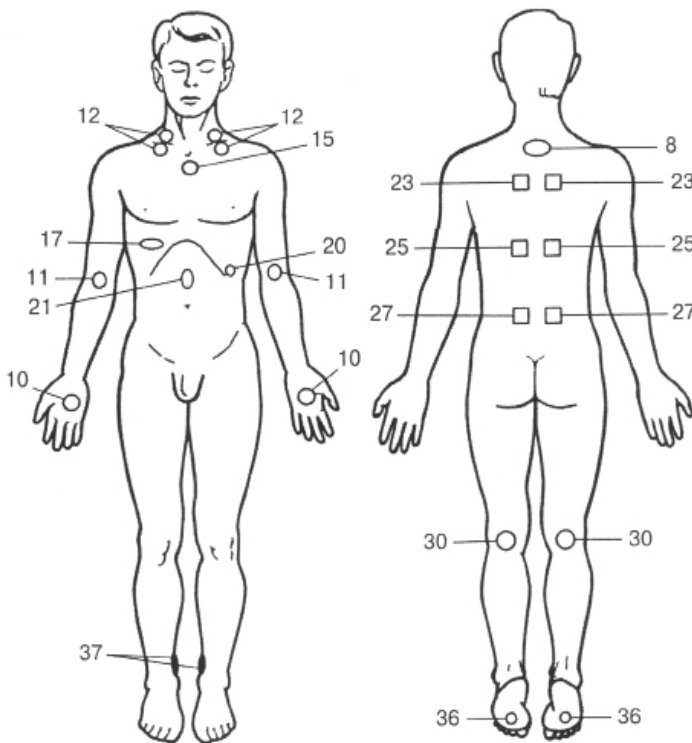
- Area 37 (the lower third of the internal surface of the tibia);

- Area 36 (the plantar surface of the foot).

Use 2-3 zone in one session.

MLT IR - ZL (zone of lesion).

Influence zones		
US	MLT IR	MLT Rd
23; 25; 27	ZL	11; 30; 12; 20; 36; 37



## SURGICAL DISEASES

MLUST in the treatment of surgical diseases is carried out in order to enhance the healing process, reduce treatment periods, prevent festering, since, thus activated are the bioenergetic processes in cells and tissues, stimulated are the redox reaction, increased is the cells metabolic activity of regenerating tissues. This leads to an increase in functional activity of fibroblasts, which causes acceleration of their differentiation and the restoration of collagen formation, stimulation of formation processes of granulation and scar tissue.

### K65 PERITONITIS

**Peritonitis** - an inflammation of the peritoneum, accompanied by common symptoms of the diseased organism with the impaired function of vital organs and systems.

#### **Etiopathogenesis**

Peritonitis, despite the initiating it reasons, is stated as a bacterial inflammation, causative agents of which are pathogenic cocci, Escherichia coli, and often anaerobes, bacteroides, etc. In recent years, it was found that up to 35% of peritonitis are caused by several bacterial pathogens - by 'associations of microbes.

In the pathogenesis of peritonitis main role belongs to intoxication. It is found that the area of the peritoneum is approximately equal to the area of skin surface. Evolving in a closed cavity suppurative process quickly leads to flooding of the body with toxins both bacterial and endogenous origin, characteristics of serous covering contribute to the rapid involvement of it in the inflammatory process, which is usually accompanied by severe exudation. During the exudation on the parietal and visceral peritoneum the absorbing toxins fibrin overlay is formed.

#### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
-	75-99	10	MLT - 15(totally)

#### **METHOD OF TREATMENT**

Position of the patient - lying on his back.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 5-7.

Possible combination with other treatments:

- Drug therapy.

Methods of exposure: labile and stable on the recommended areas.

MLT is carried out contactly. Inductors are set (stable) on a projection of pathological focus, or in paravertebral reflex zones and the zone of the medulla oblongata.

MLT IR

1. Zone 13 (percutaneous irradiation of blood vessels in the femoral area (on one side of the body) - 10 minutes;

2. Zone 15 (the projection of the thymus gland) - 5 minutes.

After 4-6 hours the exposure on the following zones is carried out by 1.5 minutes:

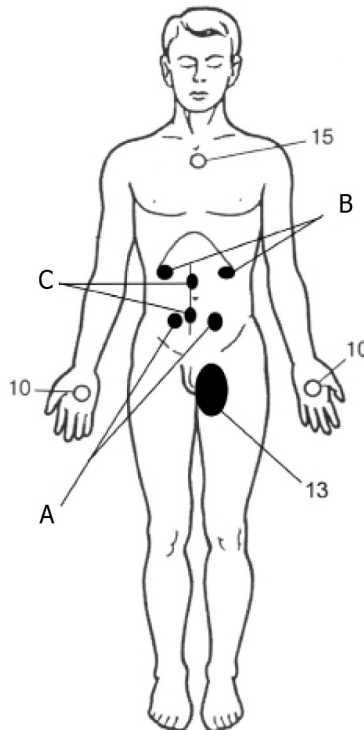
MLT IR - zone A (iliac area on the right / left);

- Zone B (left / right upper quadrant);

- zone C (during the surgical wound in the two points).

MLT Rd - Zone 10 (palmar surface of hands).

Influence zones		
US	MLT IR	MLT Rd
-	13, 15, a, b, c	10



## L91.0 KELOIDS (PREVENTION SUPPURATION)

### Etiopathogenesis

Keloid scar formation happens mainly due to the extracellular matrix, in particular with the collagen. Extracellular matrix is a supra-molecular complex including various types of chemical compounds (proteins, polysaccharides, proteoglycans, etc.). Of all proteins the collagens are the main component of the extracellular matrix and are the most abundant occupying about 1/3 of all body proteins. The growth of excess extracellular matrix in the keloid occurs as a result of «wound» fibroblasts activity. In the intact (healthy) skin fibroblasts are responsible for the remodeling of components of the dermis, they destroy the old collagen and lay the new. In wounds, injuries, burns and surgical interventions in the sores appear myofibroblasts, which tend to «seal the gap» in the tissues, hard putting the components of the extracellular matrix: collagen, glycosaminoglycans, elastin and other proteins. This is due to the proliferation of fibroblasts and excessive production of extracellular matrix scarring growth occurs.

### TREATMENT SCHEME:

On the front panel of the device are set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
-	75-99	2-5, the first three days, 37 and 77 the next	MLT - 2.5-3 per zone, 15 (total)

### METHOD OF TREATMENT

Position of the patient - lying.

Position of transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 7-8.

Possible combination with other treatments:

- Drug therapy.

Methods of exposure: a stable, on the 10 cm<sup>2</sup> area wound - 2 fields of exposure.

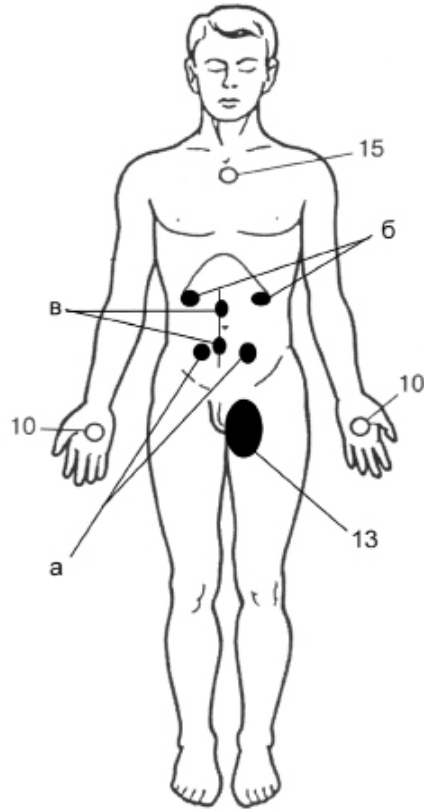
MLT IR inductor is placed over a wound and around the wound surface for a distance of 3-5 mm.

With MLT Rd inductore act directly on the zone by stable method (contact).

MLT R - Zone 10 (palmar surface of hands).

MLT IR - wound area of the scar. (See Peritonitis)

Influence zones		
US	MLT IR	MLT Rd
-	Keloid scar	10



## T79.3 POST-TRAUMATIC WOUND INFECTION, NOT ELSEWHERE CLASSIFIED

### FESTERING WOUNDS

Post-traumatic wound infection is the damage of skin and underlying tissues with pus, swelling, and tissue necrosis, as well as the absorption of toxins.

#### **Etiopathogenesis**

Purulent wound infection may occur when the clean wound (chopped, cut, puncture, torn etc.) is infected or formed as a result of abscess breakthrough. Pathogens of purulent process in occasional and surgical wounds often become so-called pyogenic bacteria (staphylococcus, streptococcus etc.).

Currently, both in traumatology and surgery is considered that any occasional wound is infected, that is, it contains a certain amount of bacteria. However, bacterial contamination does not necessarily entail an abscess. The development of infection requires a combination of the following factors: sufficient tissue damage; presence of devitalized tissue in the wound cavity, foreign bodies and blood streamed; sufficient concentration of pathogens. MLT is carried on clean wound (purulent discharge absorbs up to 90% of the laser light).

#### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
-	12-15	37 the first three days, 75 following.	MLT - 5 on the area, 10 (total)

#### **METHOD OF TREATMENT**

Position of the patient - lying.

Position transmitter: contact.

Frequency of treatments: daily.

Number of treatments: 13.

Possible combination with other treatments:

- Drug therapy.

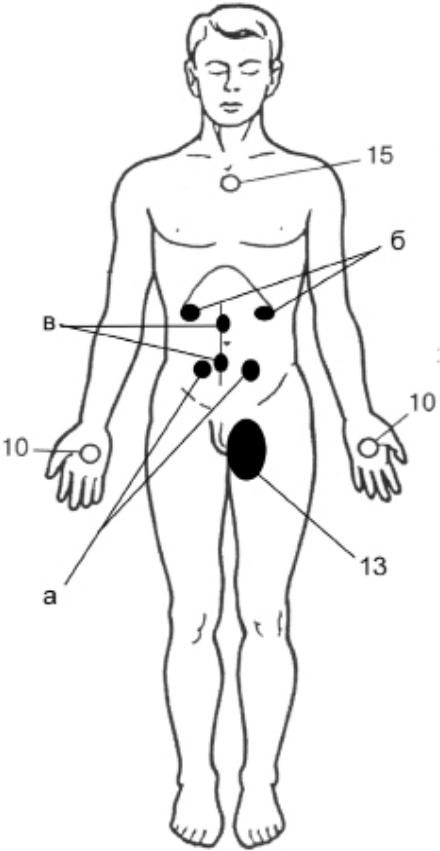
Methods of exposure: a stable, on the 10 cm<sup>2</sup> area wound - 2 fields of exposure.

MLT IR inductor is placed over a wound and around the wound surface for a distance of 3-5 mm.

With MLT Rd inductore act directly on the zone by stable method (contact).

MLT Rd - Zone 10 (palmar surface of hands).  
 MLT IR - wound area of the scar.

Influence zones		
US	MLT IR	MLT Rd
-	wound, keloid	10



## L02 ABSCESSSES, BOILS, CARBUNCLES

### L03 PHLEGMON, FELON

#### Etiopathogenesis

Phlegmon and felon occur at penetration into the tissue of a homogeneous or mixed pyogenic bacteria flora (staphylococcus, streptococcus, E. coli and others.). May be formed as tissue necrobiosis and therefore without microbial flora, when certain chemical substances or drugs enter under the skin.

The development of acute purulent processes contribute to violations of trophism, circulatory disorders, tissue crush at injuries and traumas, bruises, weakening the body's resistance. Abscess formation usually starts with an inflammatory infiltrate in the center, in which then the decay of white blood cells occur with the formation of proteolytic enzymes; the latest digest necrotic tissues and products of cellular decay forming a purulent exudate. On the periphery of the inflammatory focus demarcation shaft is formed: first by lymphocyte multiplication, and then through the development of granulation tissue and connective tissue sheath (pyogenic shell). Rapidly expanding, granulation tissue is moving to the center of the inflammatory focus, filling defect tissues. Before the formation of granulation shaft of the hearth there is increased absorption of toxic products and bacteria through the lymph and blood pathways, resulting in a total intoxication of the patient. Formation of granulating shaft prevents the absorption of toxins and microbes.

#### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
-	75-99	5, 10, 20, 31, 50, 80 every day at the new frequency	MLT - 2.5-3 on one field, 15 total

#### METHOD OF TREATMENT

Position of the patient - lying / sitting.

Position of transmitter: contact.

Methods of exposure: a stable, 2-4 fields around the hearth.

Frequency of treatments: daily.

Number of treatments: 5-7.

Possible combination with other treatments:

- Drug therapy.

MLT IR inductor is placed over a wound and around the wound surface for a



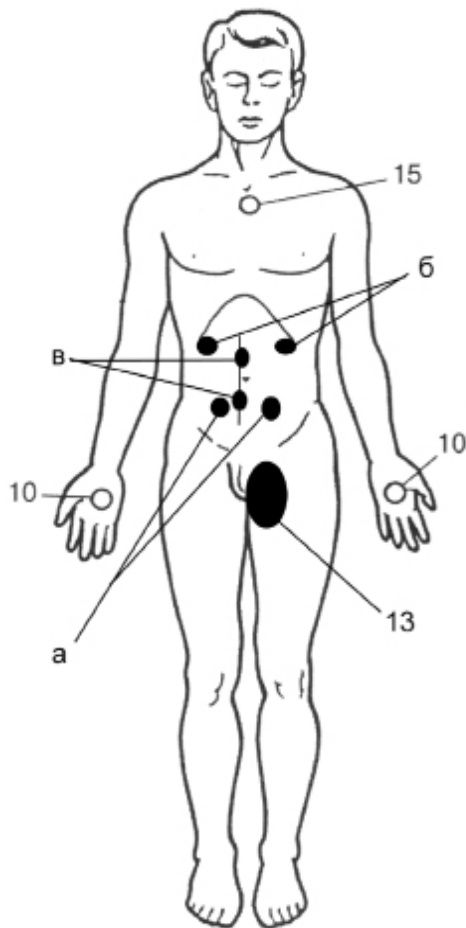
distance of 3-5 mm.

With MLT Rd inductore act directly on the zone by stable method (contact).

MLT Rd - Zone 10 (palmar surface of hands).

MLT IR - around the hearth.

Influence zones		
US	MLT IR	MLT Rd
-	Around the hearth	10



## E14.5 TROPHIC ULCERS

The trophic ulcer is the long lasting uncured defect of skin and the tissues located under it.

### **Etiopathogenesis**

Varicose trophic ulcers more often arise in the lower third of a shin against varicose expanded veins. Chronic venous insufficiency (at a varicosity, a post-thrombophlebitic illness), deterioration in arterial blood circulation can lead to development of a trophic ulcer (at a hypertensive illness, diabetes, atherosclerosis), violation of outflow of a lymph (lymphedema), a trauma (freezing injuries, burns), chronic diseases of skin (eczema, etc.). The trophic ulcer can develop at some infectious diseases, system diseases (vasculitis), violation of local blood circulation at a long immovability as a result of an illness or a trauma (bedsores).

The violation of a venous bloodstream caused by diseases of venous system leads to deposition of blood in the lower extremities. Blood stagnates, the cells waste products accumulate in it. Nutrition of tissues worsens. Skin is condensed, conglutinate with hypodermic cellulose. Dermatitis, wet or dry eczema develop.

Because of ischemia process the healing of wounds and scratches worsens. As a result the smallest injury of skin at chronic venous insufficiency can be the reason of development of the long-lasting, badly treated trophic ulcer. Accession of an infection complicates the course of the disease and leads to development of various complications.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
-	12-15	37-50, 2-nd course – 75-80	MLT - 10-15

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

Position of transmitter: contact.

Methods of exposure: stable.

Frequency of treatments: daily.

Number of treatments: 7-8.

Re-treatment: a week later.

Possible combination with other treatments:

- Drug therapy.

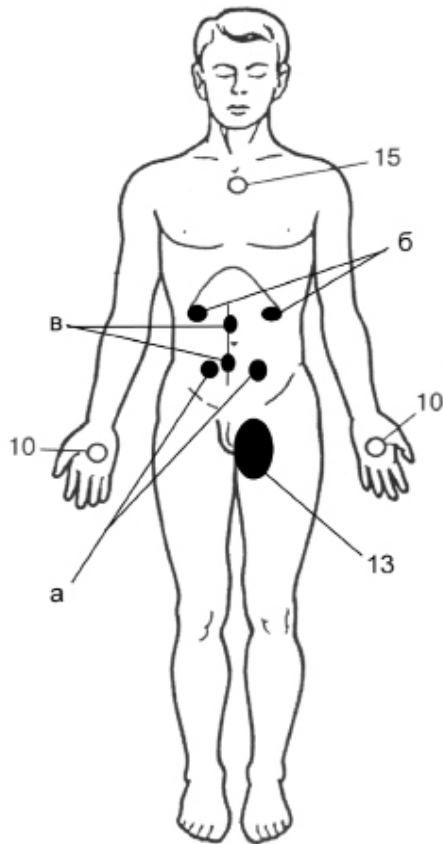
Inductor MLT IR is placed directly on the edge of the ulcer or young granulation tissue through a single layer of sterile cloth or protective foil.

With the MLT Red inductor act directly on the zone by stable method (contact).

MLT Rd - Zone 11 (ulnar fovea right / left).

MLT IR - Zone of the ulcer edge.

Influence zones		
US	MLT IR	MLT Rd
-	Edges of an ulcer	11



## 180 PHLEBITIS AND THROMBOPHLEBITIS

**Thrombophlebitis** is an inflammation of the venous walls with formation of thrombus within the lumen of the vein. Most often thrombophlebitis occur in the lower limbs.

### **Etiopathogenesis**

Predisposing factors are: slowing of the blood flow, changes in its composition, due to which the blood loses its normal rheological properties. Thrombophlebitis may develop on the background of violations of blood coagulation. Often the root cause of thrombophlebitis is an injury of the vascular wall, endocrine disorders, infections or allergic reactions. A number of diseases can be complicated by thrombophlebitis: varicose veins, purulent infections, hemorrhoids, cancer, blood diseases and heart.

Medical manipulation (long-term catheterization) and surgery on the blood vessels increase the risk of thrombosis.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	1,2; 25; 8; 10; 89	UST - 3 per zone; MLT - 3 per zone, up to 10 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: a stable or labile without tissue compression.

Frequency of treatments: daily.

Number of treatments: 7-8.

Repeated treatment: in two weeks 1 time per day.

Possible combination with other treatments:

- Drug therapy (detoxification, antibacterial).

Inductor MLT IR should be slowly (1 cm / sec) moved along the affected vessel in the direction from the center to the periphery of the body, then transferred over the limb to the initial point of contact and then slowly moved to the end of the affected area. Influence on 1-3 zones depending on the length phlebothrombosis.

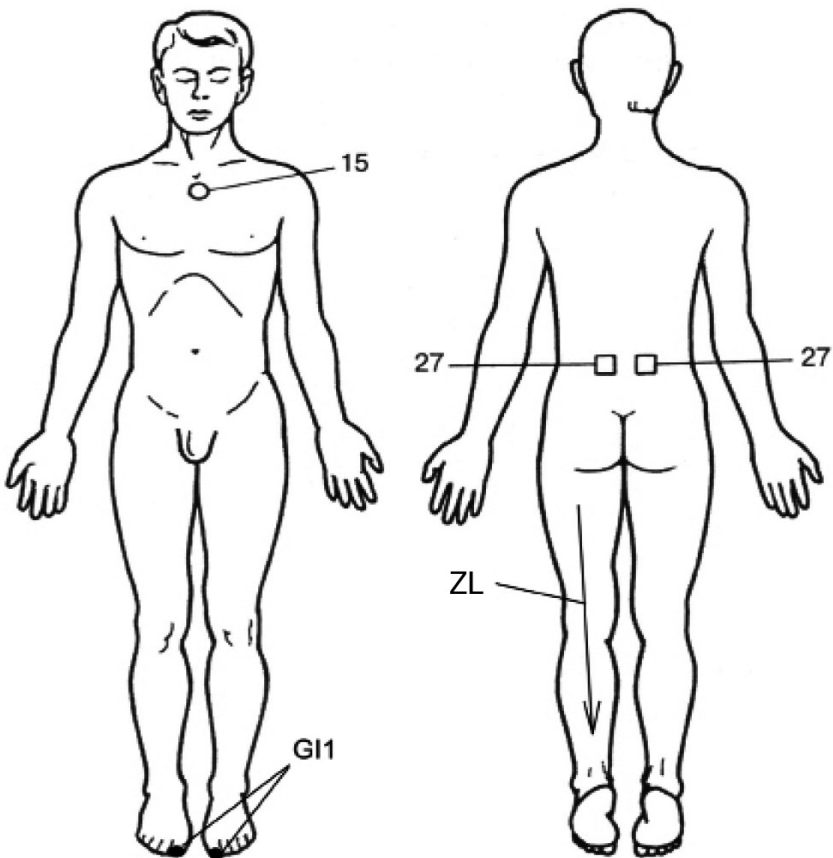
With the therapeutic terminal MLT Red act directly on zone with the stable method (contact).

MLT Rd - zone 15 (the projection of the thymus gland).

MLT IR - ZL (zone of the lesion).

- GI1 (nail plate of the thumb on the right / left), starting with the 4th procedure for 2.5 minutes at the point, the modulation frequency of 75-80 Hz.  
 UST - Zone 27 (paravertebrally, D11-L5).

Influence zones		
US	MLT IR	MLT Rd
27	ZL; GI1	15



## A46 ERYSIPELAS

**Erysipelas** is an anthroponotic acute infectious disease caused by hemolytic streptococci, characterized by fever, intoxication, presence of local focus serous-hemorrhagic skin lesions with a propensity to recurrent course.

### **Etiopathogenesis**

Etiology: b-hemolytic streptococcus group A.

At the exogenous way of infection the source are the patients with any streptococcal disease (Tonsillitis, pharyngitis, scarlet fever, streptoderma etc.) or healthy carriers of streptococci, ways of transmission - airborne, contact; with auto-infection pathogen enters the lesion from endogenous foci of streptococcal infection.

At penetration of pathogens into the lesion by contact way (through the skin microtrauma) or hematogenically-lymphogenous way (with auto-infection) there are: activation of mediators of the allergic inflammatory response, development of serous or serous-hemorrhagic inflammation with erythema, edema and infiltration of the affected areas of skin and subcutaneous tissue, the involvement in the process microvascular, lymphatic capillaries, damage the vascular walls and elimination of streptococci through increased phagocytosis and humoral immune system with preservation of skin sensitization, re-entering of streptococcus, sclerosis and obliteration of the repeatedly damaging blood vessels, chronic lymphostasis up to elephantiasis.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	5	UST - 3 per zone, 12 in total; MLT - 7.5 - vascular bundle, 5 - the affected area

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator, the method of exposure: contact at several points or distantly by stable method.

Frequency of treatments: two times a day.

Number of treatments: 7-8.

Re-treatment: in three weeks the same course every other day.

Possible combination with other treatments:

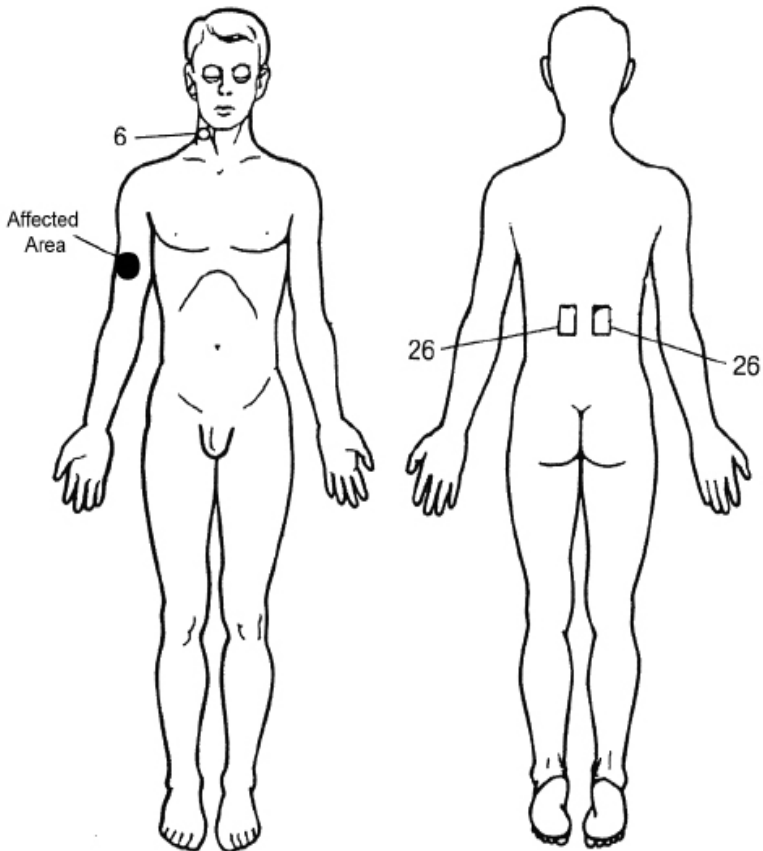
- Drug therapy.

MLT Rd - Zone of on-vein irradiation of blood (vascular bundle area above the affected area).

MLT IR - ZL (the affected area).

UST - Zone 26 (paravertebrally, D11-L1, the projection of the segmental innervation of the adrenal glands and kidneys).

Influence zones		
US	MLT IR	MLT Rd
26	Affected area	6 (the projection of the carotid artery)



## T20-T32 THERMAL AND CHEMICAL BURNS

**Burn** is the damage of tissue caused by local exposure to high temperatures (more than 55-60 C), aggressive chemicals, electric current, light or ionizing radiation.

### **Etiopathogenesis**

According to the depth of tissue damage there are 4 degrees of burns. Extensive burns lead to the development of so-called burn disease, fatal dangerous due to irregularities in the cardiovascular and respiratory systems, as well as the occurrence of infectious complications.

Therapy is indicated for the expressed syndrome of exudative inflammation in the case of superficial burns, for the prevention of complications and stimulation of reparative processes in wounds, with subdermal burns to improve blood and lymph circulation in paranecrotic area and stimulating the formation of high-grade granulating cover in the preoperative period with deep burns, and in the postoperative period - to stimulate the regenerative processes; for the prevention and treatment of pneumonia and secondary immunodeficiency.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	75-80	UST - up to 6 in total; MLT IR - 2 to 3 on affected area. MLT Rd -15 total.

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: distantly at a distance of 5-6 mm from the surface of the wound.

Methods of exposure: labile.

Frequency of treatments: two times a day.

Number of treatments: 7-8.

Re-treatment: in three weeks the same course each otherday.

Possible combination with other treatments:

- Drug therapy.

MLT is carried early after burn injury on the open wound surface through the dressing. Exposure time of 8 seconds per zone (until the rejection of necrosis), 4



seconds - after the removal of necrotic tissue. Effect on 3-4 points at 1% of the area.

MLT Rd - Zone 6 (projection of the carotid artery);

- Area 10 (palmar surface of the hand on the right / left);

- Area 36 (the plantar surface of the foot).

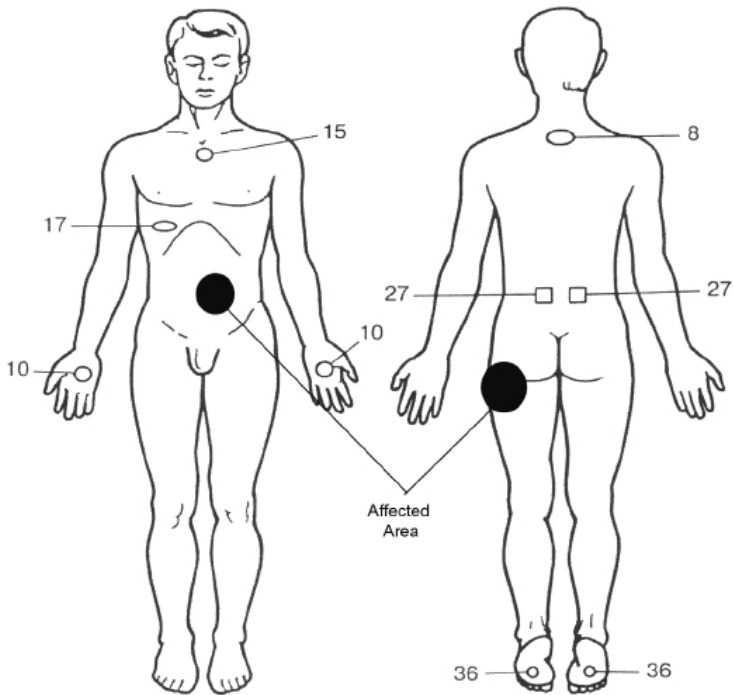
MLT IR - ZL- zone of lesion (the affected area);

- Zone 8 (C8 projection D2 vertebral segments).

UST - Zone 27 (paravertebrally, D11-L1, the projection of the segmental innervation of the adrenal glands and kidneys);

- Area 17 (the projection of the liver).

Influence zones		
US	MLT IR	MLT Rd
17; 27	Affected area; 8	6; 10; 36



## M42 OSTEOCHONDROSIS

Disease of the musculoskeletal system, which is characterized by lesions or destruction of articular cartilage and underlying bone. Previously, the term osteochondrosis defined a group of various degenerative diseases of the skeleton. Today, this term was fixed for the lesions of the joints of the spine and intervertebral discs.

### **Etiopathogenesis**

The etiology of osteochondrosis is not enough clear. Of great importance are genetic predisposition, age-related changes in the intervertebral discs, their acute or chronic trauma, segmental blood circulatory disorders.

In the pathogenesis of osteochondrosis the important role play the changes of the pulp nucleus, in particular its dehydration, which leads the to loss of amortization functions, changing the load conditions on the annulus fibrosus and to its gradual destruction.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	1-10 (P1 mode)	UST - 10 in total. MLT - 15 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying on his stomach.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended areas.

Frequency of treatments: every other day.

Number of treatments: 14-15.

Re-treatment: three weeks later the same course in a day.

Possible combination with other treatments:

- Massage (MLUST before the procedure);
- Physical training.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

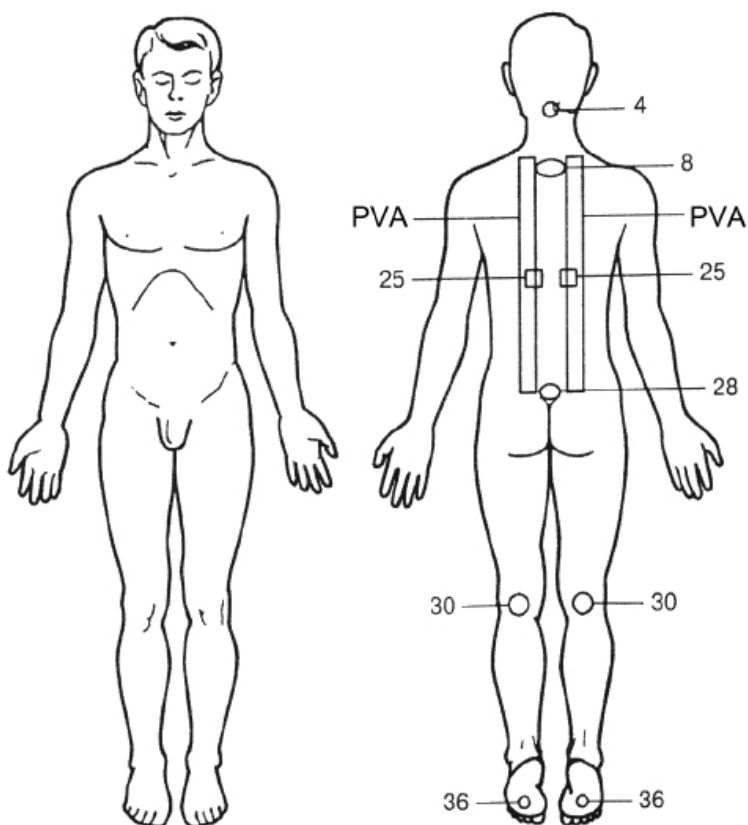
UST- PVA zone (paravertebral area at the level of C7-L5 vertebrae);

- Area 25 (paravertebrally, D7- L2, segmental innervation zone of the liver).

MLT Rd - Zone 28 (lumbosacral joint);

- Area 30 (popliteal fossa on the right / left);
  - Area 36 (the plantar surface of the foot to the right / left).
- MLT IR - Zone 4 (foramen magnum - the brain stem);
- Zone 8 (the projection of the C7-D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
PVA; 25	4; 8	28; 30; 36



## M54.4 4 LUMBAGO WITH SCIATICA

**Sciatica** (lumbar and sacral radiculitis) is a syndrome that is manifested by pain spreading along the sciatic nerve.

### **Etiopathogenesis**

Mechanical causes: apophyseal osteoarthritis, degeneration of the discs; disc hernias, fractures, sacroiliac dysfunction; limited movement of hips.

Infectious reasons: epidural abscess or osteomyelitis.

Tumors: Bone tumors (primary or metastatic).

Intradural tumors of the spinal cord.

Metabolic: osteoporosis, osteomalacia, chondrocalcinosis.

The mechanism of lumbago is always the same and doesn't depend on the reasons. At displacement or deformation of the vertebrae and intervertebral discs are excited many painful nerve endings located in the fibrous ring and ligaments surrounding the vertebrae. As a result, there is severe pain and spasm (strong tension and inability to relax) of the muscles surrounding the spine.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	75-77	UST - 3-5 per zone; MLT - up to 10 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying on his stomach.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 7-10.

Retreatment: a month later.

Possible combination with other treatments:

- Massage (MLUST before the procedure);
- Electrostimulation of paravertebral muscles in alternation with MLUST;
- Physical therapy.

UST is carried out directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.). As the drug for entering may be used 0.5% solution of novocaine.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

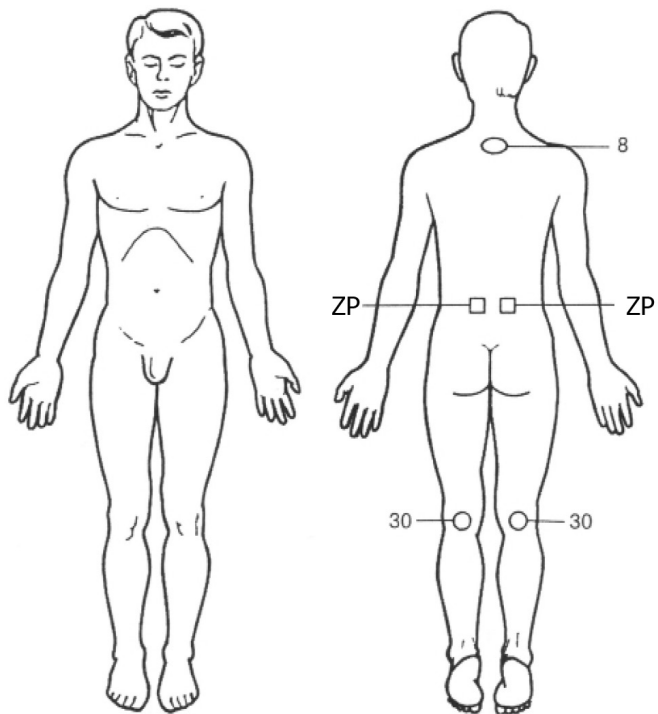
UST - PA zone (area of pain).

MLT Rd - Zone 30 (popliteal fossa on the left);

MLT IR - Zone 30 (popliteal fossa on the right);

- Zone 8 (the projection of the C7- D2 vertebral segments ).

Influence zones		
US	MLT IR	MLT Rd
Pain zone	30 on right; 8	30 on left



## R52 CHRONIC PAIN SYNDROME

### *(Pain, not elsewhere classified)*

The sensation of pain is caused by a variety of agents, but they share a common feature - a real or potential danger to damage the body. Therefore pain signal mobilizes the body to protect against pathogen and protective restriction of function of the affected body part.

#### **Etiopathogenesis**

Causes of pain: physical (trauma, high or low temperature, high dose of UV, the electric current), chemical (contact with skin or mucous membranes of strong acids, alkalis, oxidizing agents, the accumulation in tissues of calcium and potassium salts) and biological (high concentration of kinins, histamine, serotonin) factors.

Therapy is indicated for the prevalence of degenerative changes accompanied by pain.

#### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	75-77 alternated with 10-100 (mode F2)	UST - 3-5 per zone, 15 total MLT - up to 25 in total.

#### **METHOD OF TREATMENT**

Position of the patient - lying on his stomach.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: 1-2 days.

Number of treatments: 14-15.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Psychological correction;
- The central electroanalgesia or electrosleep.

Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

UST - Zone 17 (the projection of the liver);

- Area 21 (the projection of the celiac plexus);

- Area 25 (paravertebrally, D7- L2, segmental innervation zone of the liver).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

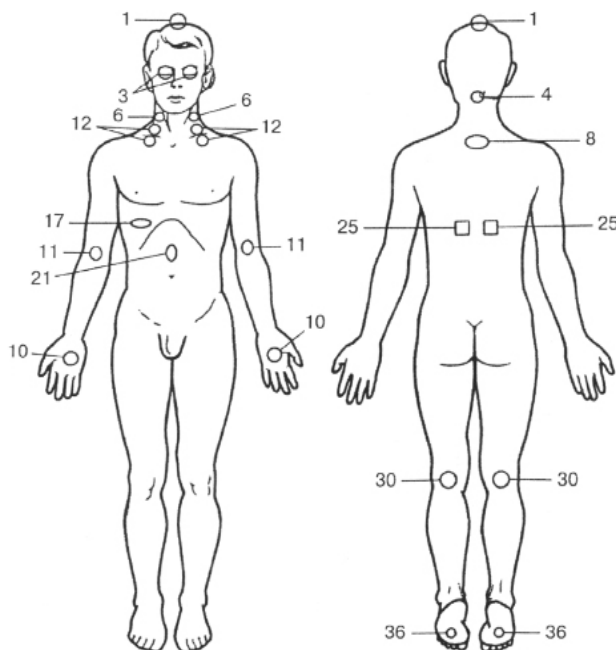
- Zone 6 (projection of the carotid artery on the right / left);
- Area 11 (ulnar fovea right / left);
- Area 12 (over-and subclavian vein to the right / left);
- Zone 3 (the eye).

MLT IR zone 1 (projection-reflex epiphysis area);

- Zone 8 (the projection of the C7- D2 vertebral segments);
- Zone 4 (the projection of the brain stem).

During a session conducted on-vein (on the artery) irradiation of blood with the red magnet-laser inductors of zones 6, 11, 12 or 30, and act on two zones (zone 6 for instance - to the left and to the zone 30 - right) for 5 - 7 min each. Other day on the affected area 3 on both sides for 5 - 7 minutes which alternate with zones 1, 4 (MIT apparatus IR). Also, during each session provide the ultrasonication for 5 - 7 minutes in one of the zones (17, 21, 25). The remaining area is used as an additional. This frequency modulation of all the factors must be changed: one day apply frequency 75 - 77 Hz, and the next - scanning frequency 10 - 100 Hz. This principle is common, regardless the localization of pain. However, for influencing on pathologically altered hearth (zone of the pain such as Gustedau-herpetic center) used is MF + IR radiation for 5 - 7 minutes with the above parameters.

Influence zones		
US	MLT IR	MLT Rd
17; 21; 25	1; 4; 8	3; 6; 11; 12; 10; 36



**MYOFASCIAL PAIN**  
**M60.0 MYO FASCIITIS;**  
**M62.8 MIOFIBROSIS;**  
**M79.0 FIBROSIS; FIBROMYALGIA;**  
**M72.5 FASCIITIS.**

**Myofascial pain** (MP) is not generalized, nonspecific muscle pain caused by dysfunction of myofascial tissues and the emergence of irritability foci in muscles (trigger points - TP).

«Miogeloz» «fibrositis», «Myofasciitis» «myositis» «fibromyositis» «myalgia» - painful nonspecific muscle tissue seal, which are the source of muscle pain.

**Etiopathogenesis**

Causes: skeletal abnormalities (different length на legs, flat feet), repetitive stereotyped movements, leading to fatigue of individual muscles; prolonged immobilization of muscles; prolonged compression of the muscles; hypothermia; psycho-emotional stress; pathology of the internal organs. The mechanism of pain include sensory, motor and autonomic components.

Traumatization of the muscle, leading to the formation of MP is associated primarily with the muscular overload. With continued prolonged muscle contraction suffers the intramuscular capillary blood flow, reduced oxygen levels and glucose metabolism is impaired in cells, leading to their damage.

**TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	12-15	37,5 alternate with 75-77	UST - 3-5 per zone, 15 total; MLT - up to 25 in total.

**METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: 1-2 days.

Number of treatments: 14-15.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Physical therapy;
- Massage;



- Kinesitherapy.

Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

UST- PA (pain area, TP);

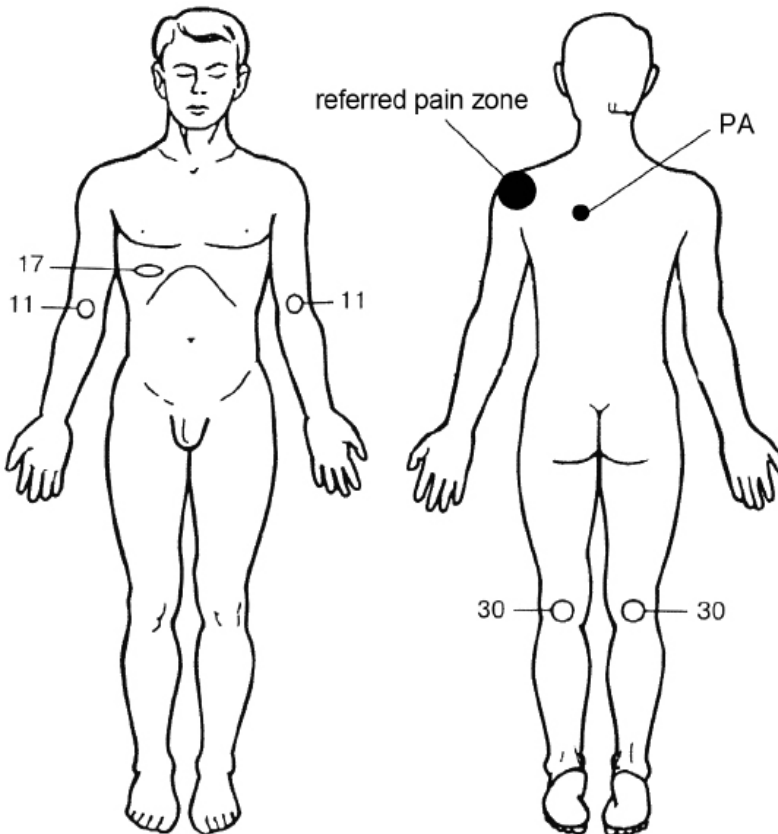
- Zone (the projection of the liver).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Area 11 (ulnar fovea right / left).

MLT IR - RPZ (referred pain zone).

Influence zones		
US	MLT IR	MLT Rd
PA; 17	RPZ	11; 30



# M00-M99 DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE

## M 00 - M 03 INFECTIOUS ARTHROPATHIES

The group of diseases that are characterized by the same type of lesions of the musculoskeletal system.

### **Etiopathogenesis**

Reactive arthritis is most often associated with chlamydia (*Chlamydia trachomatis*) urogenital infection.

Pathogenetic mechanisms of reactive arthritis is yet unknown, although it is clear the involvement of immune response to bacteria of the urogenital tract. It is believed that the development of immunocomplex synovitis due to excessive immune response to microbial antigens of microorganism outside the joint cavity, with the formation of immune complexes which are deposited in the synovium.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-4	75-99	1.2 alternate with 77	MLT - 10 per zone, UST - 5-7 in total;

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Physical therapy;
- Massage.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.) around the affected joint.

### **ATTENTION!**

*When exposed to the knee scoring is carried out on all sides, except the patella.*

*When exposed to hip dubbing is performed on both sides - the front and rear.*

*When multiple lesions of joints the influence on them is carried out alternately,*

**and the total duration of the procedure is increased up to 8-10 minutes.**

Hydro-lens can be as contact medium when exposed to small joints of hands and feet.

MLT is carried out simultaneously with UST-contactly. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 2 (the affected joint);

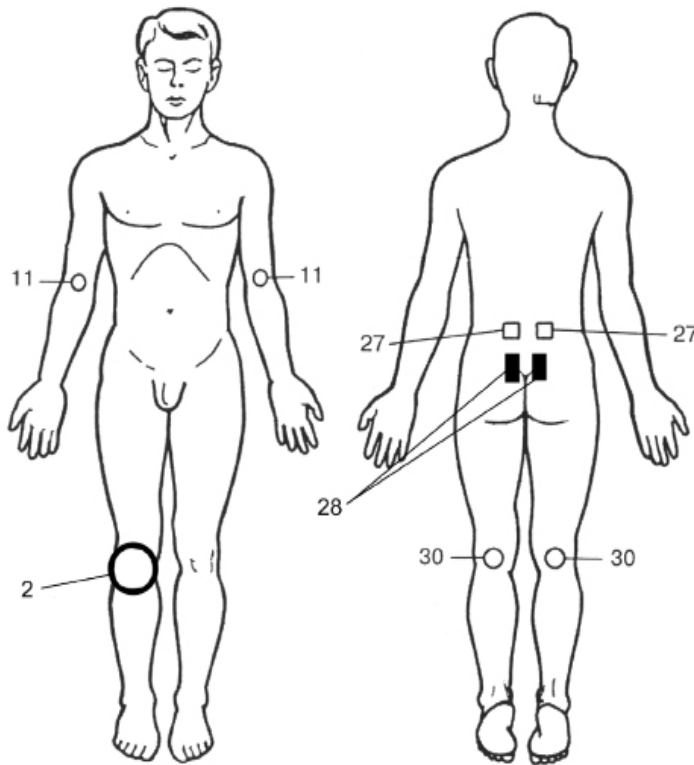
- Area 28 (paravertebrally, segmental innervation of the affected joint area).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Area 11 (ulnar fovea right / left).

MLT IR - Zone 27 (paravertebrally, D11- L1 segmental innervation of the kidney area).

Influence zones		
US	MLT IR	MLT Rd
2; 28	27	11; 30



## M05-M14 INFLAMMATORY POLYARTHRITIS

### (RHEUMATOID ARTHRITIS).

**Rheumatoid arthritis (RA)** is the most common chronic inflammatory joint disease characterized by the formation of tumor-like hyperplasia of the synovial membrane (pannus), which is peculiar to invasive growth with the destruction of articular cartilage and underlying bone.

#### **Etiopathogenesis**

There is no etiological factor that is only responsible for the development of RA. It is believed that the disease occurs in genetically susceptible individuals under the influence of various external and internal disturbances - viral or bacterial infections, traumas, including surgery, psycho-emotional stress, medical interventions, age hormonal changes, etc. To date, accumulated ample evidence of genetic susceptibility to RA.

The main pathologic process in RA is the destruction of articular cartilage and subchondral bone by ectopic hyperplastic synovial tissue.

#### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
1-2 sessions – 2, from 3 session - 3	75-99	37,5 alternate with 75	US - 5-7 on the joint; MLT - 10 per zone, up to 25 totally.

#### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Inductothermy;
- Physical therapy;
- Massage.

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

«DIKASIN-1» is effective medicine for ultraphonophoresis.

**ATTENTION!**

**When exposed to the knee scoring to carry out on all sides, except the patella.**

**When exposed to hip joint to perform on both sides - the front and rear.**

**When exposed to multiple joints to impact on them alternately, and the total duration of the procedure is increased up to 8-10 minutes.**

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

UST- zone 2 (the affected joint);

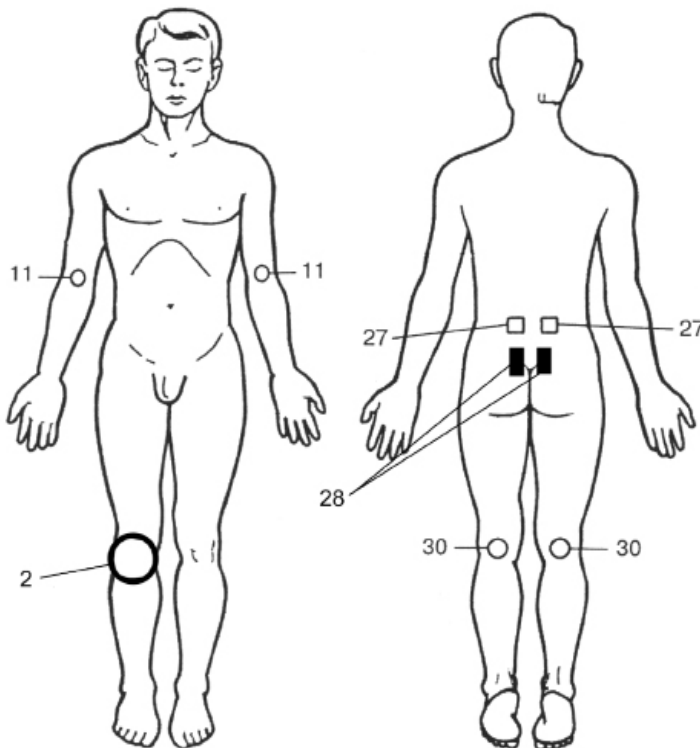
- Area 28 (paravertebrally, segmental innervation of the affected joint area).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Area 11 (ulnar fovea right / left).

MLT IR - Zone 27 (paravertebrally, D11- L1 segmental innervation of the kidney area).

Influence zones		
US	MLT IR	MLT Rd
2; 28	27	11; 30



## M15-M 19 DEFORMING ARTHROSIS

Chronic inflammatory degenerative disease of joints with primary degeneration of the articular cartilage and the subsequent reactive-degenerative processes in the epiphysis of articulated bones.

### **Etiopathogenesis**

Pathogenesis of deforming arthrosis is quite complicated. Destructive-dystrophic changes that characterize this pathology are the multifactorial process, often develops gradually and has subtle clinical manifestations. Bright symptoms usually indicates the fact that joints are seriously affected.

The trigger can be any agent which usually provide damaging effect on hyaline cartilage. Often is an injury or chronic joint microfractures, violation of congruency of its contact surfaces, which are the manifestation of dysplasia, systemic lesions of connective tissue, etc. The impetus for the emergence of osteoarthritis are also unfavorable life and working conditions of the patient, dysfunction of the sympathetic nervous system, pathology of neurohumoral level, genetic, immune, endocrine, enzymatic and vascular factors.

In general, a violation of regional circulation, capillary stasis, and developing as a result of this, hypoxia play an important role in the pathogenesis of deforming arthrosis as contribute to changes in aerobic and anaerobic oxidation reactions.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2 - paravertebrally, 5 - the affected joint	75-99	18 alternate with 77	US - 6-10; MLT - 10 per zone, up to 25 totally

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 7-10.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Thermotherapy;
- Balneotherapy (bath).

Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

Effective phonophoresis hydrocortisone ointment to the area of the joint.

**ATTENTION!**

**When exposed to the knee scoring is carried out on all sides, except the patella.**

**When exposed to hip joints is performed on two sides - the front and externally.**

MLT is carried out simultaneously with the UST contactly. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

UST - zone 2 (the affected joint);

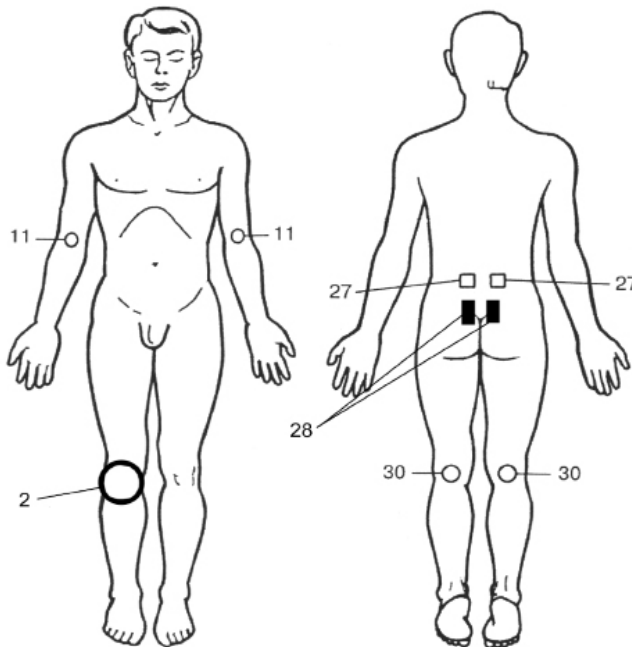
- Area 28 (paravertebrally, segmental innervation of the affected joint area).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Area 11 (ulnar fovea right / left).

MLT IR - Zone 27 (paravertebrally, D11- L1 segmental innervation of the kidney area).

Influence zones		
US	MLT IR	MLT Rd
2; 28	27	11; 30



## M10-M14 ARTHRITIS GOUTY

Develops on the background of gout.

### Pathogenesis

The etiology of gout:

1. The reasons causing the decrease in the excretion of uric acid (90%) are genetically caused hypofunction of kidney enzyme systems, dehydration, chronic renal failure, etc.

2. Reasons causing overproduction of uric acid (10%): the genetically caused decrease in activity of hypoxanthine-guanine phosphoribosyltransferase, increased activity of 5-phosphoribosyl-1-synthetase, myeloproliferative diseases (polycythemia, leukemia), psoriasis, hypernutrition with a predominance of monotonous meat food, consumption of alcoholic beverages (especially beer, dry wine).

Pathogenesis of gout: uric acid metabolism enzymes defects and other etiological factors of uric acid overproduction, and / or decrease in its excretion, hyperuricemia, urates tissue deposition, urate crystals activation in the glenoid cavity, accumulation of urate crystals in renal interstitium and tubules.

### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3 - paravertebrally, 4-5 - the affected joint	75-99	1,2; 18 alternate with 77	UST - 5 on the field, a total of not more than 15. MLT - 10 per zone, up to 20 in total.

### METHOD OF TREATMENT

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 7-10.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Diet therapy;
- Massage;
- Physical therapy;
- Phytotherapy.



Exposure to ultrasound is performed directly on the body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

Effective is the phonophoresis of hydrocortisone ointment to the area of the joint.

**ATTENTION!**

**When exposed to the knee scoring, is carried out on all sides, except the patella.**

**When exposed to hip dubbing is performed on two sides - the front and externally.**

On the small joints of the hands and feet the impact is carried out through a water lens.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata

UST - Zone 2 (the affected joint);

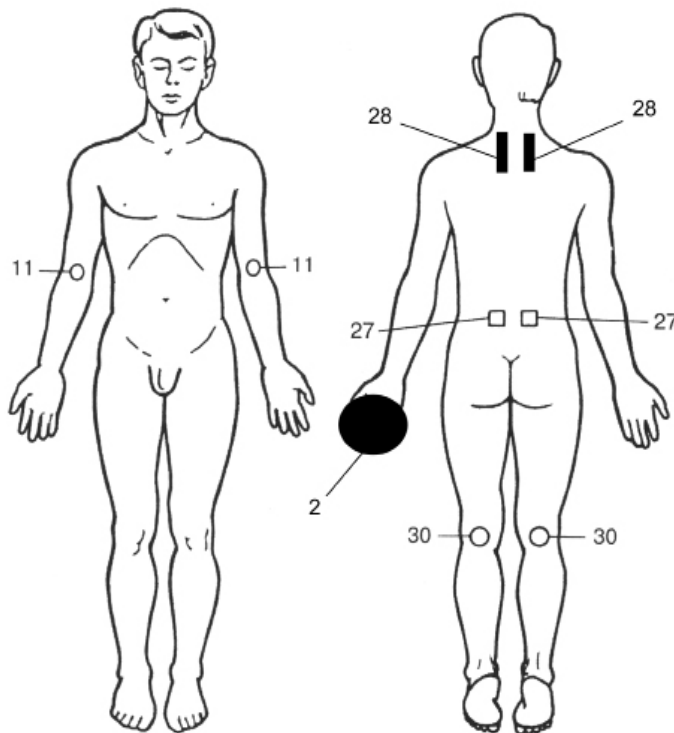
- Area 28 (paravertebrally, segmental innervation of the affected joint area).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Area 11 (ulnar fovea right / left).

MLT IR - Zone 27 (paravertebrally, D11- L1 segmental innervation of the kidney area).

Influence zones		
US	MLT IR	MLT Rd
2; 28	27	11; 30



## K07 DISEASES OF THE TEMPOROMANDIBULAR JOINT

Diseases of the temporomandibular joint (TMJ) are frequent and varied. The most common are arthritis, arthritis and sprains. In addition, there are the pathological condition of the joint that are the symptoms of a variety of neuromuscular disorders of the maxillofacial region. The complex treatment of these diseases includes orthopedic.

### **Etiopathogenesis**

The osteoarthritis of TMJ can be caused by general and local reasons. The general should include the metabolic, neurodystrophic, endocrine disorders, infectious diseases; local concern: long current inflammatory process in the joint; excessive load on the articular surface of the head of the lower jaw, which may be associated with neuromuscular disorders of the maxillofacial region, such as bruxism; with the absence of teeth, especially the side, the occlusive dentition surface deformation and abnormal abrasion. These factors can be combined with each other. Degenerative processes in the joint may develop as a result of the impact of general and local factors - a violation of both cellular and extracellular mechanisms for trophism.

The general mechanism of development of osteoarthritis of TMJ is that the cartilage covering the articular surface of the condyle head gradually undergoes degeneration, sometimes disappearing; degenerative processes can lead to perforation of the disc.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	1,2; 18 alternate with 77	USB - 3-5 in total; MLT - 10 in total

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 6-15.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Drug therapy;
- Diet therapy;
- Massage;
- Physical therapy;
- Phytotherapy.

Impact UST conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 2 (temporomandibular joint).

MLT Rd - Zone 15 (the projection of the thymus gland).

MLT IR - Zone 8 (C7-D2 projection of the vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
2	8	15



## K07.6 CALCANEAL SPUR

**Plantar fasciitis** (plantar fasciitis) is an aseptic inflammation of the soft tissue at the site of attachment of the plantar fascia to the heel bone. At the deposition of calcium salts in the area the osteophyte (bony growths) - heel spurs is formed.

### **Etiopathogenesis**

Contributing factors for plantar fasciitis include: excessive pronation (tucking inwards) of the foot when walking; too high or flat arch of the foot; walking, jogging or prolonged standing on a hard surface; overweight; wearing uncomfortable shoes or worn shoes; stress of the Achilles tendon or leg muscles.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
5	75-77	18 alternate with 77	US - 3-5 in total; MLT - 10 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Methods of exposure: labile or stable, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 15-20.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Diet therapy;
- Massage;
- Physical therapy.

Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

Effective is the phonophoresis of analginum with hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

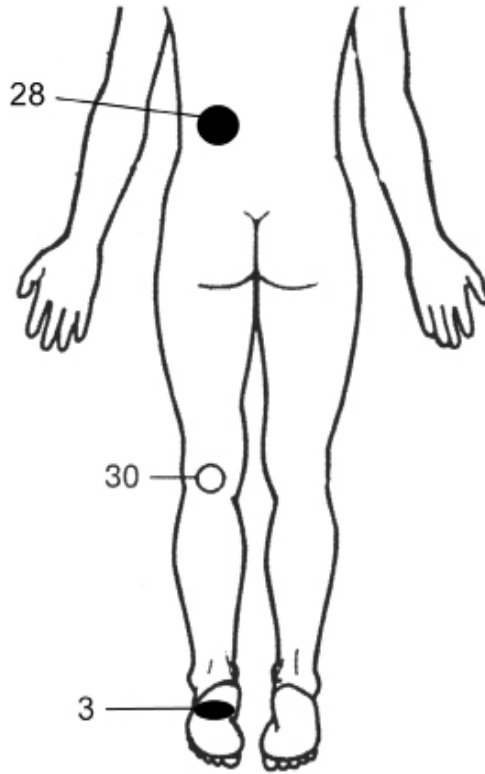
UST - Zone 3 (the projection of heel spurs from the soles).

MLT Rd - Zone 30 (popliteal fossa from heel spurs).

MLT IR - Zone 28 (paravertebrally, kidney projection on the side of heel spurs).

At the case of bilateral lesions treatments are alternated every other day.

Influence zones		
US	MLT IR	MLT Rd
3	28	30



## M 65.2 CALCIFYING TENDOVAGINITIS

**Calcifying tendovaginitis** is the disease of muscles at which the inflammatory process is localized on an internal surface of a fibrous sinew of a vagina.

### **Etiopathogenesis**

Tendovaginitis can arise as an independent disease or as the provoked inflammatory process of inside sinews of a vagina on the background of the main illness. In the first case, as a rule, consider aseptic (crepitant tendovaginitis). In the second case - infectious (specific and nonspecific). Aseptic tendovaginitis in most cases results from receiving micro injuries in connection with implementation of professional activity or excessively intensive sports activities. It is caused by performance of the same movements with involvement of limited group of muscles therefore there is the wrong distribution of loading.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-2,5	75-99	9,4; 9,7; 7,7	UST - 5-8 in total; MLT - 10 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: a contact.

Methods of exposure: labile, the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 8-12.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Diet therapy;
- Massage;
- Physical therapy.

Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

Effective is the phonophoresis of hydrocortisone.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - zone 3 (in the course of the tendon);

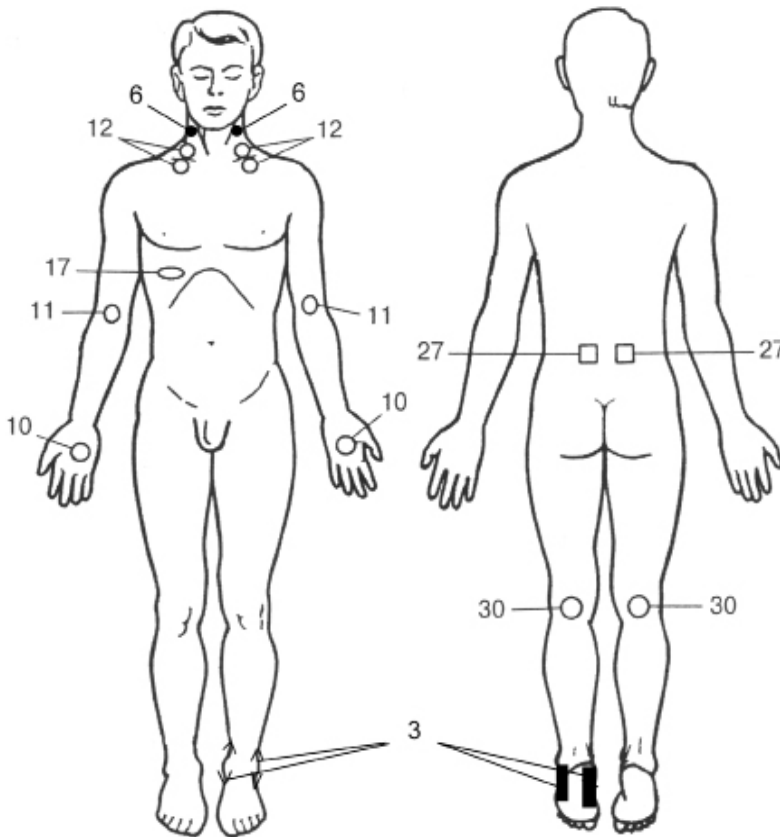
- Area 17 (the projection of the liver).

MLT Rd - on-vein irradiation of blood above the lesion locations:

- Area 30 (popliteal fossa on the right / left);
- Zone 6 (projection of the carotid artery on the right / left);
- Area 11 (ulnar fovea right / left);
- Area 12 (over-and subclavian vein to the right / left).

MLT IR - Zone 27 (paravertebrally projection of D7-L2 segmental innervation of the liver).

Influence zones		
US	MLT IR	MLT Rd
3; 17	27	30; 6; 11; 12



## M45. BEKHTEREV'S DISEASE (ANKYLOSING SPONDYLITIS)

Chronic inflammatory disease of the spine that affects mainly the sacroiliac intervertebral joints, edge-vertebral joints and the joints of the vertebrae processes.

### **Etiopathogenesis**

The role of the main etiological factor plays the histocompatibility complex, HLA-B27. In male ankylosing spondylitis occurs in about 5-9 times more frequent than the female. But the etiology and pathogenesis is a different concept, if you will, the different stages of disease development. If the causative factor inextricably linked to the major histocompatibility complex, the pathophysiology of the disease is closely intertwined with impaired immune response at some point, the immune system starts to produce antibodies not against bacteria and other foreign cells, but against its own elements of the connective tissue. Antibodies bind to specific antigens in joints (connective tissues and other sites) that causes inflammation. This inflammation has been called autoimmune, as the immune system attacks its own cells.

The role of the factors that trigger the described above processes can play chronic infections of gastrointestinal and genitourinary system, spinal injuries, chronic stress and other adverse factors.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	1,2; 10; 28; 77	UST - 5-10 in total in the inactive phase, not more than 5 in the active MLT - 20 total.

### **METHOD OF TREATMENT**

Position of the patient - lying on his stomach.

The position of the radiator: contact.

Methods of exposure: labile, on the recommended area.

Frequency of treatments: daily or every other day.

Number of treatments: 10-12.

Re-treatment: in 2-3 months.

Possible combination with other treatments:

- Balneotherapy;
- Mud-therapy;
- Massage;
- Physical therapy.



Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.). MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 23 (paravertebrally, D7-L1).

- Area 17 (the projection of the liver).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Zone 6 (projection of the carotid artery on the right / left);

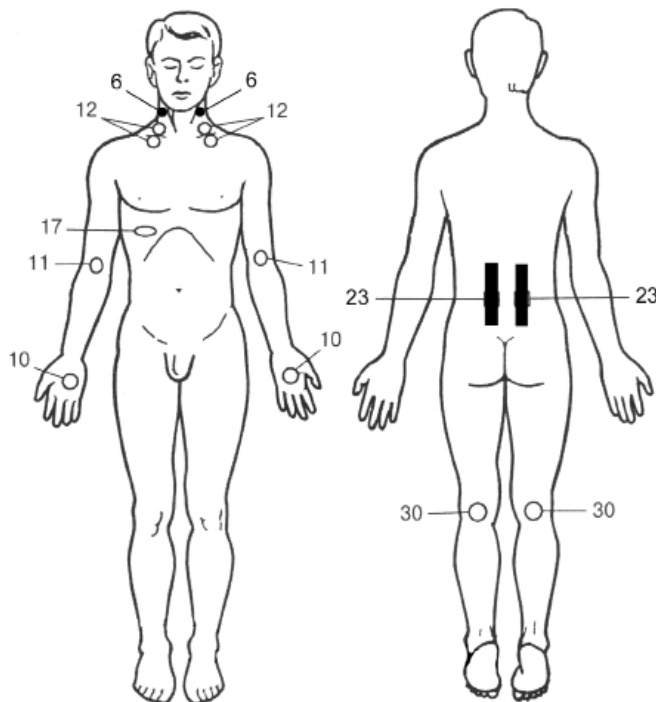
- Area 11 (ulnar fovea right / left);

- Area 12 (over-and subclavian vein to the right / left).

MLT IR (after ultrasound)

- Zone 23 (paravertebrally projection D7-L2 segmental innervation of the liver).

Influence zones		
US	MLT IR	MLT Rd
23; 17	23	30; 6; 11; 12



## M24 DUPUYTREN'S CONTRACTURE

Contracture (disease) of Dupuytren (DC) - fibro proliferative disease characterized by lesions of the palmar fascia, leading to progressive flexion contractures of the fingers.

### **Etiopathogenesis**

The pathogenesis of the disease is not studied enough. The disease is the result of constant trauma of the palmar surface of the hand, but this theory has not been confirmed. Some authors suggest a genetic predisposition to the disease. Was suggested a theory of autosomal-dominant mode of inheritance with variable.

There are several theories of the pathogenesis of the disease. Sanderson et al. (1992) found influence the overall dyslipidemia on the proliferation of fibroblasts and overproduction of collagen in the palmar aponeurosis[10]. Murrell (1992) at local hand and wrist ischemia (different origins) found that ATP in oxygen is converted successively into hypoxanthine, xanthine and uric acid, xanthine dehydrogenase epithelial exposed, thereby forming highly reactive free OH radicals. The toxic effect of radicals, in turn, causes a violent proliferative response of fibroblasts with collagen overproduction.

A contributing factor is the hand microtraumas.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	18; 28	UST - 5-8 per zone; MLT - 20 in total.

### **METHOD OF TREATMENT**

The patient - sitting / lying.

The position of the radiator: contact.

Methods of exposure: a stable or labile on the recommended zone.

Frequency of treatments: daily.

Number of treatments: 10-12.

Re-treatment: in 3-4 months.

Possible combination with other treatments:

- Mud-therapy;
- Massage;
- Physical therapy.

Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

«DIKASIN-1» is effective medication for phonophoresis.

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 3 (palmar surface of the hand in the amended palmar fascia);

- Area 17 (the projection of the liver); - Area 24 (paravertebrally, projection of the segmental innervation of the hand skin D4-7).

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Zone 6 (projection of the carotid artery on the right / left);

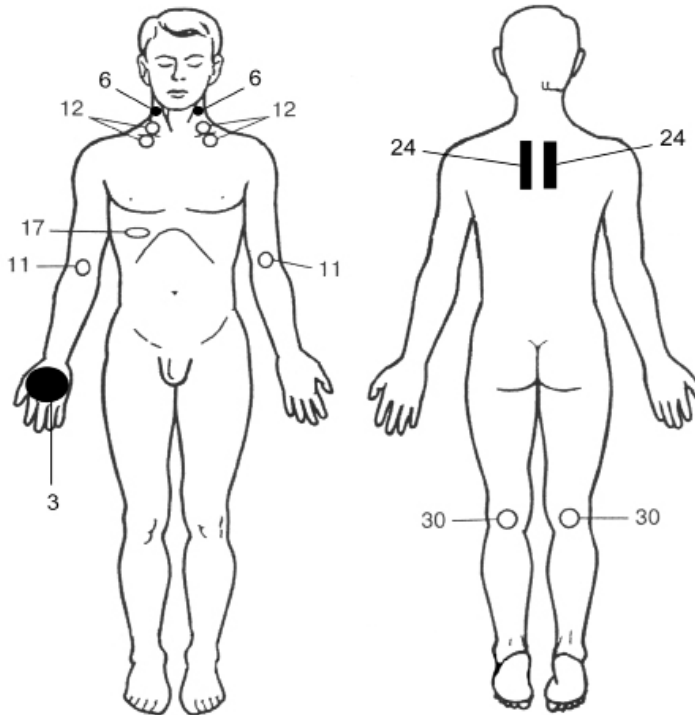
- Area 11 (ulnar fovea right / left);

- Area 12 (over-and subclavian vein to the right / left);

MLT IR (after ultrasonic sound)

- Zone 23 (paravertebrally, projection of segmental innervation of the hand skin D4-7).

Influence zones		
US	MLT IR	MLT Rd
3; 24; 17	24	11; 6; 12



## M81 OSTEOPOROSIS

**Osteoporosis** is a consequence of violation of reorganization processes balance of bone tissue and is characterized by its rarefaction (reduction of weight by unit of volume, i.e. density of a bone tissue) that involves decrease in mechanical durability of a bone.

### **Etiopathogenesis**

The major etiologic (causative) factors for osteoporosis include:

- lack of physical activity, diet and the associated weight,
- alcohol, smoking, lack of intake of dietary vitamins.

Elasticity and stability of the bone deteriorates in case of extended for several months limb immobility. At the same time proved is the improving of these indicators due to physical exertion. Lack of physical activity, reduction of the load on the muscles lead to the fact that the entire musculoskeletal system, including the spine, is deprived of the necessary muscle support, and the reduction of bone tissue occurs.

An additional factor that increases the likelihood of development of the pathological process, serves sharp decline in food and bulimia, leading to a decrease in revenues in the body of calcium and phosphorus.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure.

AMPLITUDE US, µm	MLT POWER rel., %	MODULATION, Hz	TIME, min
from 2 to 5 increasingly	50-75	37; 69	UST - 5 per zone, 15 total MLT- 20 total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily.

Number of treatments: 14-15.

Re-treatment: 1-2 days the first 5 treatments, then a second course in three months, 2 times per week.

Possible combination with other treatments:

- Diet therapy;
- Massage;
- Physical therapy.

Methods of exposure: a stable or labile on the recommended zone.

Exposure to ultrasound is performed directly on the body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on

the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 17 (the projection of the liver); - Area 21 (the projection of the celiac plexus).

**ATTENTION!**

Zone 17 or zone 21 is used by the session.

MLT Rd - Zone 30 (popliteal fossa on the right / left);

- Area 11 (ulnar fovea right / left).

MLT IR - Zone 25 (paravertebrally D7-L2, the projection of the segmental innervation of the liver);

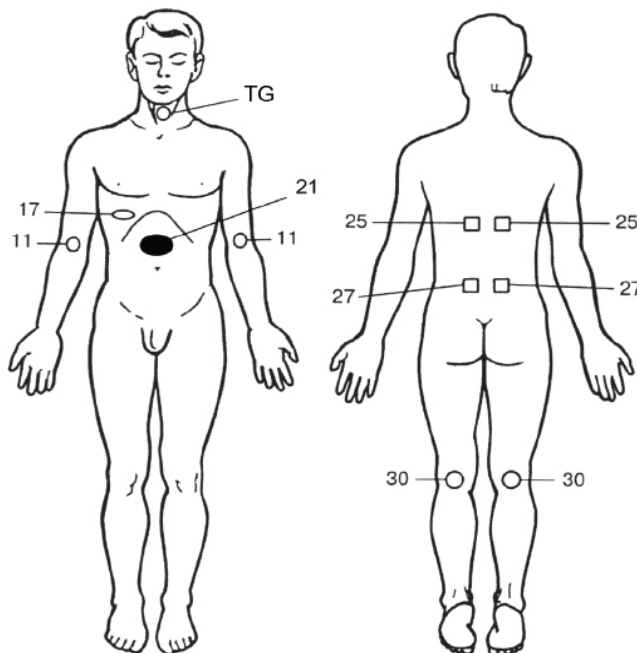
- Area 27 (paravertebrally D11-L1, the projection of the segmental innervation of the kidneys);

-TG - Thyroid area (the projection of the thyroid).

**ATTENTION!**

***On projection of thyroid gland in the absence of influence of any seals and other morphological changes, all procedures carried out up to 5, the exposure time of 1 minute.***

Influence zones		
US	MLT IR	MLT Rd
3; 24; 17	24	11; 6; 12



## G00-G99 DISEASES OF THE NERVOUS SYSTEM

### G51 NEURITIS OF THE FACIAL NERVE

#### Etiopathogenesis

The most common cause of facial nerve lesions is an infection. Provoking factor can be the cooling (riding in a car with the open window, sleeping near the open window, etc.). All that matters are injuries, disorders of blood circulation in hypertension, atherosclerosis of brain vessels and others. Noted is the selective defeat of the facial nerve in the disorder of blood circulation in the vertebral artery. Sometimes the facial nerve damage occurs as a complication of otitis media, mumps, inflammatory, neoplastic and other processes at the base of the brain. Pontino form of polio clinically is manifested as neuritis of the facial nerve. In the dental practice can be acute facial paralysis with anesthesia of the lower alveolar nerve.

#### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-4	25-50-75-99	3,9; 7,5; 9,4; 77	US - 1-7, increasing with each session; MLT - 15 in total.

#### METHOD OF TREATMENT

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily.

Number of treatments: 10.

Retreatment: in 1 month if necessary.

Possible combination with other treatments:

- Massage;
- Physical therapy.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 8 (D2-C7 projection of vertebral segments).

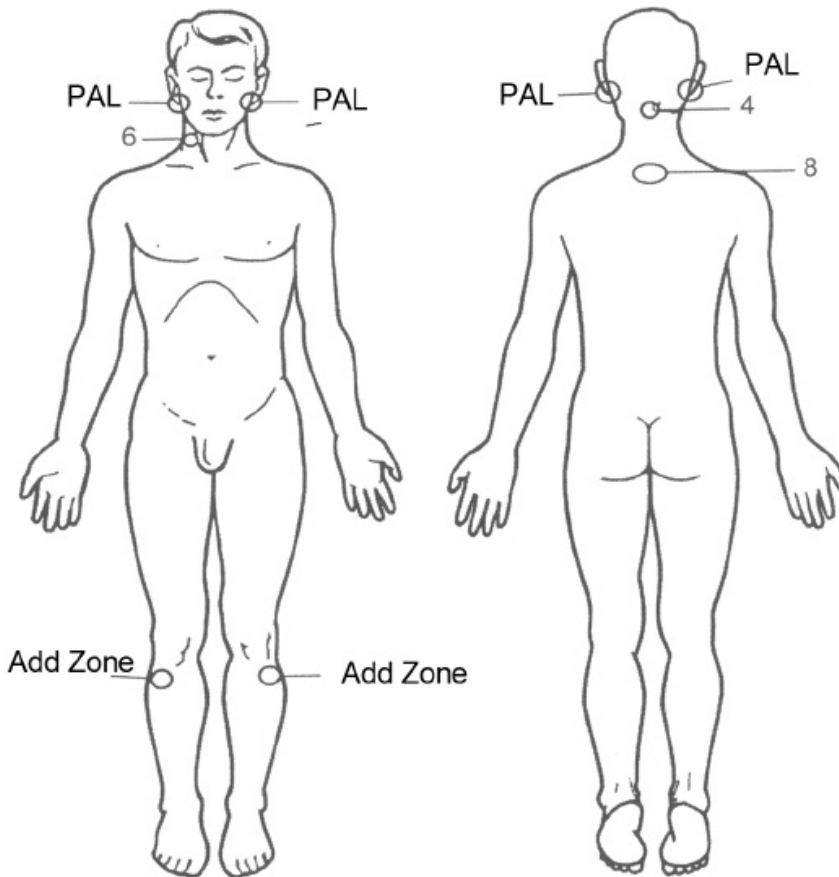
MLT Rd - Add Zone (the additional area corresponding to the right / left point E36);

- Zone 6 (projection of the carotid artery on the affected side).

MLT IR - Zone 4 (the projection of the brain stem, corresponding to the foramen magnum);

- PAL zone (possible locus area, region of the stylomastoid holes on the side of the lesion).

Influence zones		
US	MLT IR	MLT Rd
8	4; PAL	6; Add Zone



## G50 DAMAGE OF THE TRIGEMINAL NERVE

**Trigeminal neuralgia** (trigeminal neuralgia, Fothergill disease) is a severe paroxysmal bursts of pain in one or more branches of the trigeminal nerve; often induced by touching trigger points in or about the mouth.

### **Etiopathogenesis**

The pathogenesis is not completely clear. It is now believed that the disease is most likely to occur as a result of compression of the trigeminal nerve (at the point of exit from the bridge) by tortuous, pathologically altered blood vessels or, more rarely, a tumor. Rarely, in patients with multiple sclerosis plaque is formed in sensitive trigeminal nucleus, resulting in neuralgia. There may be pain as a consequence of injuries that resulted in abnormal jaw.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	3,9; 73; 75	US - 5-7; MLT - 10 totally.

### **METHOD OF TREATMENT**

The patient - sitting.

The position of the radiator: contact.

Frequency of treatments: daily.

Number of treatments: 10.

Retreatment: in 1 month if necessary.

Possible combination with other treatments:

- Drug therapy;
- Spa treatment.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 3 (paravertebral neck area).

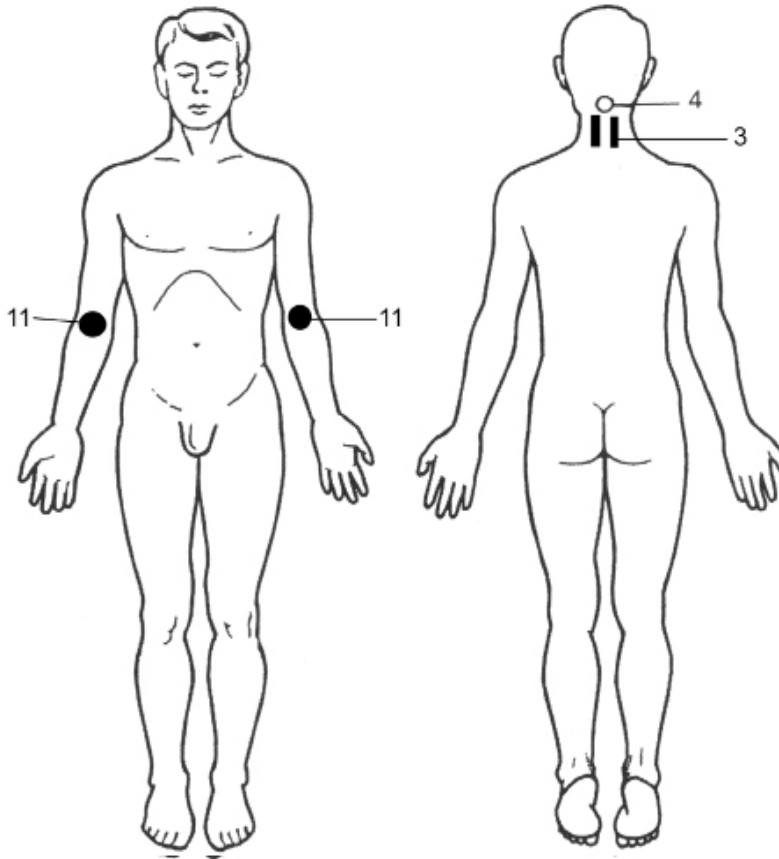
MLT Rd - Zone 11 (the projection of the neurovascular bundle in the cubital fossa).



MLT IR (after exposure to ultrasound):

- Zone 4 (the projection of the brain stem, corresponding to the foramen magnum).

Influence zones		
US	MLT IR	MLT Rd
3	4	11



## Ultrasound puncture

### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

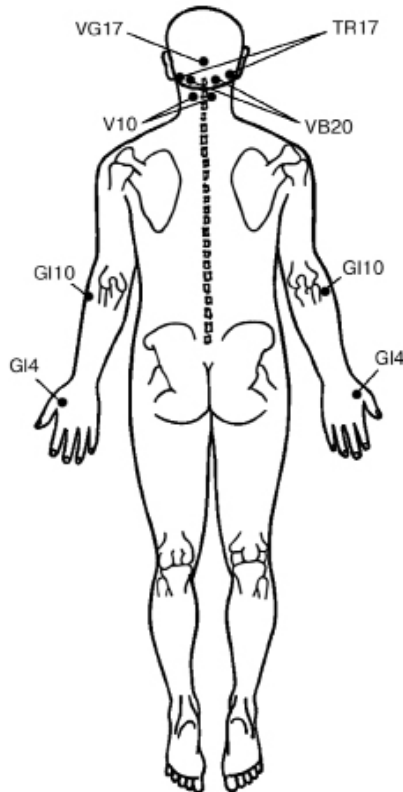
AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	0	9,4	US - 1,5 on BAP

Recommended recipe:

- 1) VG17 + VB20 (2) + GI4 (2);
- 2) V10 (2) + VB12 (2) + E36 (2);
- 3) VG17 + TR17 (2) + GI10 (2).

The maximum effect is achieved when followed by zonal laser therapy.

Influence zones		
US	MLT IR	MLT Rd
Acupuncture points	-	-



## M79.2 INTERCOSTAL NEURALGIA

**Intercostal neuralgia** (ancient Greek νεῦρον — «nerve» and ἄλγος — «algia» (pain), or thoracalgia - a compression or irritation of the intercostal nerves.

### **Etiopathogenesis**

Intercostal neuralgia is a cause of acute pain in the chest area. Often the symptoms are similar to symptoms of acute myocardial infarction, pneumonia, pleurisy and other diseases.

Reasons of intercostal neuralgia

1. An osteochondrosis of the thoracic spine, kyphosis, lordosis, and etc.
2. Injuries to the thorax.
3. Hypothermia.
4. Unsuccessful torso rotation or a long stay in an awkward position (sedentary work, etc.), long and unaccustomed physical strain on the spine.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	50-75	3,9; 99	UST - 3 for one field, 5-10 in total; MLT - 15 in total.

### **METHOD OF TREATMENT**

The patient - sitting.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10.

Retreatment: in 1 month if necessary.

Possible combination with other treatments:

- Drug therapy;
- Spa treatment.

Methods of exposure: a stable or labile on the recommended zone.

Thorax divided into 6 fields (right and left front, right and left rear, two side).

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zones 1, 2, 3 (the surface of the chest: the front left / right, rear left / right, the lateral surface of the right / left).

**ATTENTION!**

**The UST in the day to apply on two fields, excluding the region of the heart and the sternum.**

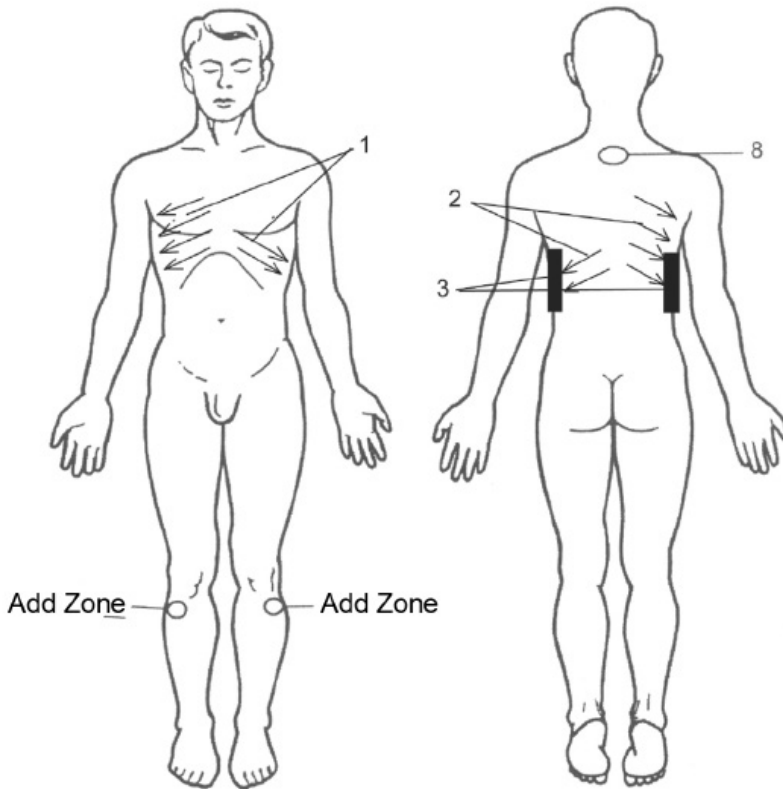
Area of influence - intercostal spaces.

Possible is the phonophoresis of hydrocortisone.

MLT Rd - Add zone (the additional area corresponding to the right / left point E36);

MLT IR - Zone 8 (projection of the C8-D2 vertebral segments).

Influence zones		
US	MLT IR	MLT Rd
1; 2; 3	8	Add Zone



## Ultrasound puncture

### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3		3,9	UST - 1 on AP, (4-6 points on session).

Special point:

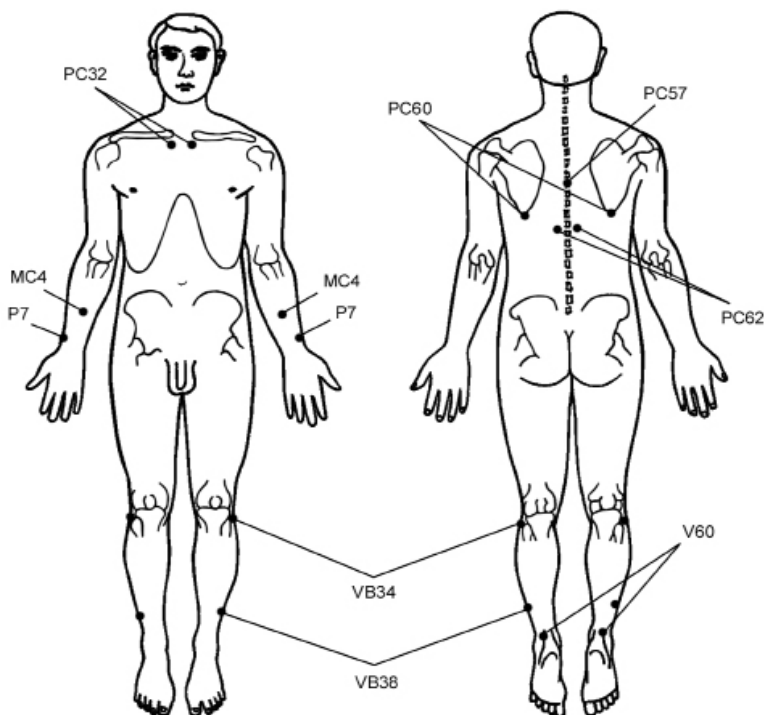
- Pain in the area of the pectoralis major muscle - P7 (1 min);
- Pain in the fourth intercostal space - MC4 (1 min);
- Pain in the side of the chest - VB34 (2 min) + VB38 (2 min);
- Pain in the thoracic region of the back V60 (2 minutes).

Additional points:

PS3; RS57; RS60; RS62.

The maximum effect is achieved by preliminary zonal laser therapy.

Influence zones		
US	MLT IR	MLT Rd
Acupuncture points	-	-



## M79.2 NEURALGIA OF CERVICAL DEPARTMENT OF THE BACKBONE

**Neuralgia** (from the Greek neuron - sinew, nerve, and algos - pain) - acute, aching, burning or dull pain in the course of the peripheral nerves arising episodic and periodic.

Pain attacks may be accompanied by pallor or redness of the skin, sweating, muscle twitching. At neuralgia there are no movement disorders and sensitivity loss, and there are no structural changes in the damaged nerve.

### **Etiopathogenesis**

The cause of the neuralgia can be the very nerve disease, nerve plexus or the processes developing in the surrounding organs and tissues as a result of injury, infections (influenza, malaria, etc.), quenching, etc. Neuralgia develops mainly in the nerves, where the nerve passes through the narrow channels of the bone and can be easily crushed or infringed its surrounding tissues. Development of the infringement and the emergence of neuralgia may be contributed by a variety of factors: hypothermia, inflammation, tumors, trauma, stress, intoxication, circulatory disorders, hernia of intervertebral disks, and so on.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	50-75	3,9; 99	UST - 1-2 on the field, 6-8 in total; MLT - 15 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying / sitting.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Repeated treatment: in two months if necessary.

Possible combination with other treatments:

- Drug therapy;
- Physical therapy;
- Spa treatment.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on

the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

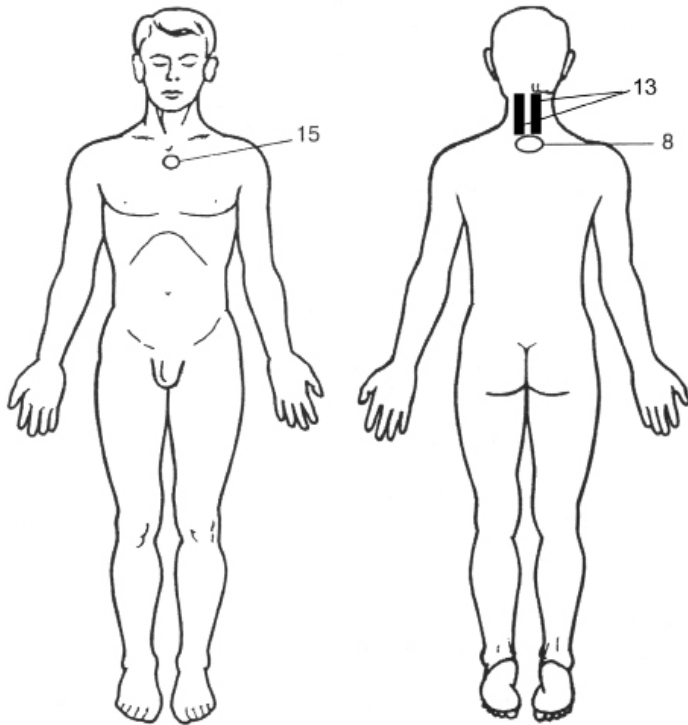
UST - zone 13 (paravertebrally C5-D2).

MLT Rd - Zone 15 (the projection of the thymus gland).

MLT IR (after ultrasound exposure) :

- Zone 8 (C5-D2 projection).

Influence zones		
US	MLT IR	MLT Rd
13	8	15



## M79.2 NEURALGIA OF THE LUMBAR SPINE

### Pathogenesis

Causes of neuralgia of the sciatic nerve (sciatica):

1. An osteochondrosis, intervertebral hernia, etc., when there is infringement of the roots with the development of sciatic neuralgia.
2. Injuries to the lumbar spine, hip fractures, pelvic tumor in the area of the passage of the sciatic nerve, infectious and inflammatory diseases of the pelvic organs, hypothermia, weight lifting, pathologic twist of the torso.
3. Sedentary lifestyle, sedentary work and pregnancy contribute to the development of sciatica.

### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-5 5 at the end of the course	50-70	3,9; 99	UST - 3 per zone, per procedure 2-3 fields; MLT - 5 per zone, 15 in total.

### METHOD OF TREATMENT

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 8-10.

Repeated treatment: in two months if necessary.

Possible combination with other treatments:

- Drug therapy;
- Physical therapy;
- Spa treatment.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (ultrasound gel, cocoa butter or other plants, drug, etc.).

MLT is performed after the contact UST at point A-SHI (pain points).

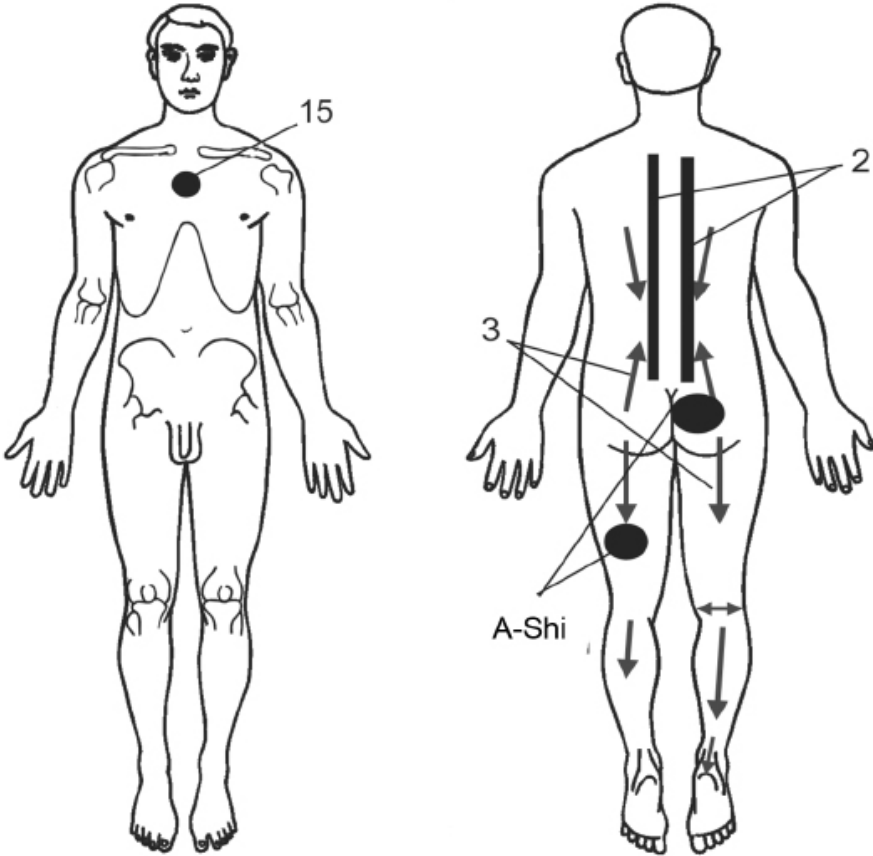
UST - Zone 2, 3 (paravertebrally D2-L5 and in the course of the sciatic nerve (thigh, calf, foot).

MLT Rd - Zone 15 (the projection of the thymus gland).

MLT IR (after ultrasound exposure) - Zone A-SHI (pain points)



Influence zones		
US	MLT IR	MLT Rd
2; 3	A-SHI	15



## T75.2 VIBRATION DISEASE

Occupational disease, characterized by a variety of clinical symptoms, peculiarities of the course of the disease; caused by the influence of local and whole-body vibration.

### **Etiopathogenesis**

The main etiological factor is the industrial vibration. Often it is accompanied by other occupational hazards (noise, cooling, static tension of muscles of the shoulder girdle, the forced oblique body position, etc.). The disease is manifested by disorders of the nervous, cardiovascular system and the musculoskeletal system. Local and general vibrations, being a strong irritant effect on the receptor apparatus of the skin and nerve trunks, increases the secretion of norepinephrine at the terminal of the sympathetic nervous system. The excess of norepinephrine can not fully be captured and accumulated in the terminal, so the significant portion enters the bloodstream, resulting in an increase in vascular tone, leads to increased blood pressure and angio-spasm. At the vibration action the destructive phenomena in the corpuscles of Vater-Pacini occur, nerve fibers, neurons of the spinal cord, reticular formation of the brain stem, spinal and sympathetic ganglia border trunks. There is reduction of afferent innervation, especially the perception of vibration sensitivity. With the development of pathological changes in somatoneurological and vegetative apparatus the degenerative changes occur in the skin, muscles, skeletal system.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
2	75-99	1,2; 6,3; 93	UST - 5-7 per zone; MLT - 5 per zone, 15 in total

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: every other day.

Number of treatments: 10-12.

Re-treatment: after 6 months.

Possible combination with other treatments:

- Drug therapy;
- Spa treatment.

Methods of exposure: a stable or labile on recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

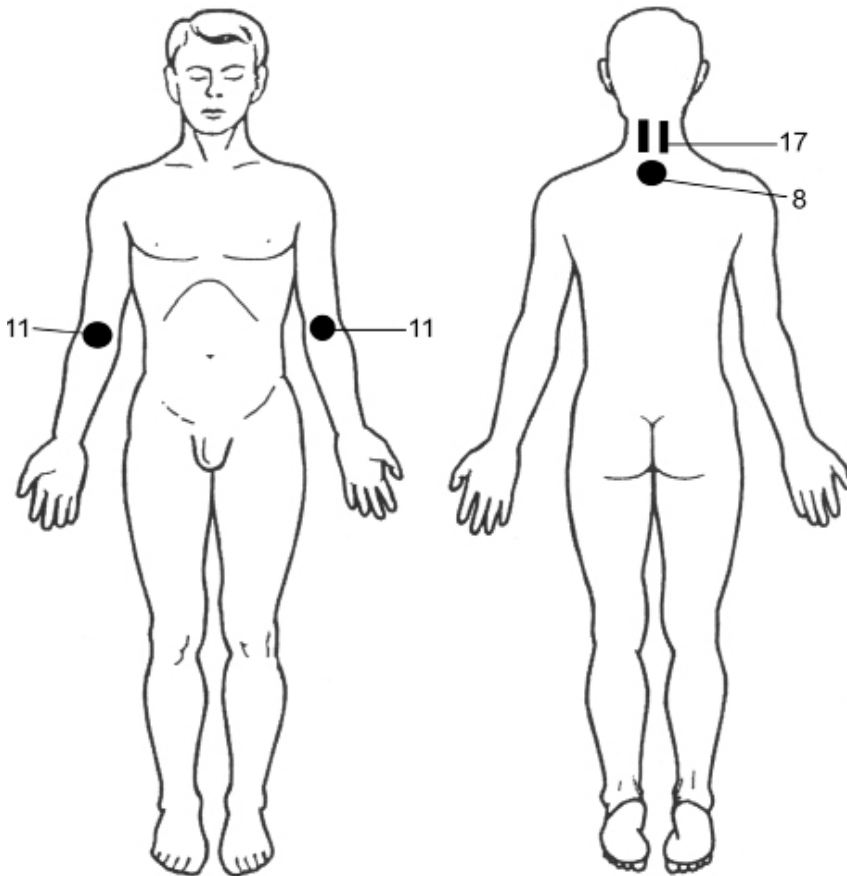
MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 17 (paravertebral cervical spine area).

MLT Rd - Zone 11 (cubital fossa on the right / left).

MLT IR (after UST) - Zone 8 (D2-C7 segments projection).

Influence zones		
US	MLT IR	MLT Rd
17	8	11



## M60 MYOSITIS

Myositis is an inflammatory damage of muscles, skeletal muscles, but not the lesion of smooth muscles of internals. In this group are integrated the most different in an etiology, course and degree of prevalence pathological processes. Both the single muscles and the big muscular massifs can be affected by myositis.

### Etiopathogenesis

Among the variety of reasons for muscle inflammation should be noted: trauma, various infections, worm infestation, physical activity, adverse external factors - the cold, vibration, intoxication, hereditary factor.

The most common myositis develop due to various infections. As a rule, these are different viruses, E. coli, Staphylococcus and Streptococcus. In this regard, myositis may be complicated by a variety of infectious diseases - flu, sore throat, inflammation of the tonsils (tonsillitis), pneumonia, inflammation of the meninges (meningitis). In the propagation of purulent infection on the body with the blood flow in the muscles are generated purulent lesions or abscesses. Especially clearly it is observed in sepsis. The introduction of purulent infection in muscle tissue may be due to trauma with damage of the skin, and even conventional intramuscular injection made with violation of the rules of antiseptics.

### TREATMENT SCHEME:

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
2-3	50-99	1,2; 6,8; 10; 73	US - a total of 5-10; MLT - 5 per zone, up to 15 in total.

### METHOD OF TREATMENT

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 10-12.

Re-treatment: after 6 months.

Possible combination with other treatments:

- Spa treatment.

Methods of exposure: a stable or labile recommended zone.

UST is conducted directly on a body or through a contact medium (ultrasound

gel, cocoa butter or other plants, drug, etc.). MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - affected muscles and paravertebrally to the relevant segments.

MLT IR (after UST) - affected muscles and paravertebrally to the relevant segments.

**ATTENTION!**

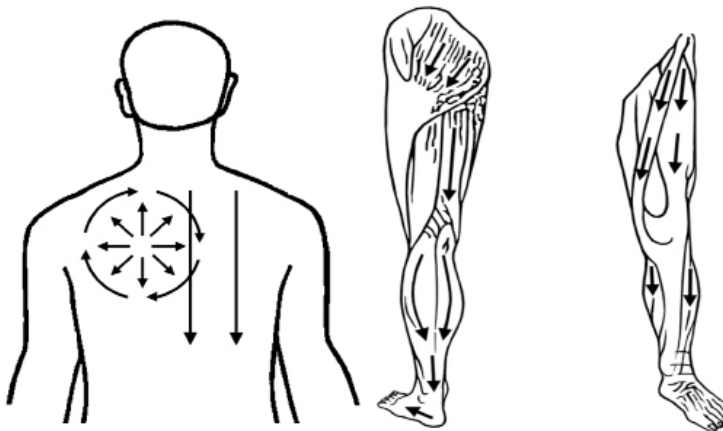
*If the focus of muscle pain is not projected on the appropriate level of the spine (arms below the elbows and legs below the knees), exposure is carried out only on the pain center.*

MLT Rd - Zone 11 (cubital fossa on the right / left);

- Area 30 (popliteal fossa on the right / left).

The figure shows, respectively, the impact zones for UST and MLT in myositis of the subaccess and muscles of the lower limbs.

Influence zones		
US	MLT IR	MLT Rd
Fig.	Fig.	11; 30



**ULTRASONIC PUNCTURE IN MYOSITIS:**

During the ultrasound puncture in myositis influence of 1.5-2 minutes at point A-SHI of affected segments. Daily, 6-8 procedures, the amplitude of the ultrasound – 2 microns, a feeling of deep heat without burning sensation in the patient.

## F00-F99 MENTAL AND BEHAVIORAL DISORDERS

### F51.0 INSOMNIA

**Insomnia** - a dissatisfaction with sleep. Insomnia is the most common complaint of sleep disorders, and the patients have a sense of the quality or lack of restorative sleep function.

#### **Etiopathogenesis**

Main causes: stress, neurosis, mental illness, neurological disorders, physical illness, psychotropic drugs, alcohol, toxic factors, endocrine and metabolic diseases.

The pathogenesis of insomnia is not well studied. Insomnia is usually the result of the interaction of biological, physical, psychological and environmental factors. The areas of the brain involved in the regulation of wakefulness include tuber-mamillary posterior hypothalamic nucleus containing histamine neurons from which the stimulatory signals are sent in the brain stem areas associated with wakefulness. From these zones the pulses diffusely are reprojected onto the cerebral cortex and ensure the maintenance of wakefulness.

#### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, $\mu\text{m}$	MLT POWER rel., %	MODULATION, Hz	TIME, min
4-5	75-99	2,4	US - 5 in total; MLT - 20 in total.

#### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

The number of procedures: the number of sessions is determined by the effectiveness of therapy.

In the case of early awakening the treatment sessions should be carried out in the morning and before going to sleep (1.5-2 hours before bedtime).

Possible combination with other treatments:

- Herbal medicine;
- Massage;
- Autogenous training;

- Psychological correction.

Methods of exposure: a stable or labile on the recommended zone.

Within one session exposure is performed simultaneously on three zones by these factors.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 17 (the projection of the liver).

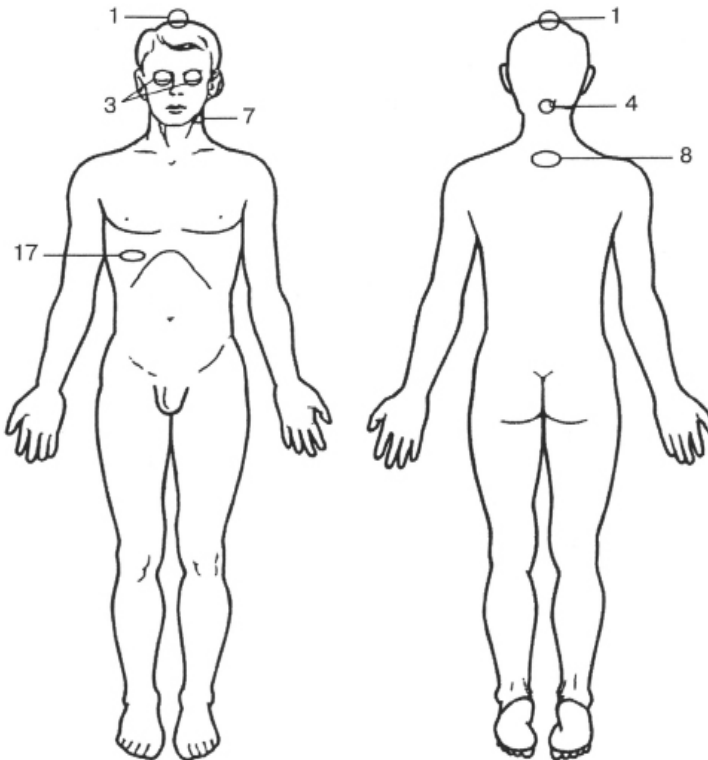
MLT Rd - Zone 3 (the eye).

MLT IR - Zone 8 (C8-D2 projection of the vertebral segments);

- Zone 4 (the projection of the brain stem);

- Zone 1 (embryological epiphysis projection).

Influence zones		
US	MLT IR	MLT Rd
17	1; 4; 8	3



## F32 DEPRESSION

**Depression** is a mental disorder characterized by «depressive triad»: depressed mood and loss of ability to experience pleasure, impaired thinking, motor retardation.

### **Etiopathogenesis**

It is shown that the affective, motor and cognitive disorders with unipolar depression are similar with common syndromes in lesions of the basal ganglia. Therefore, the hypothesis was suggested that the anatomical substrate of unipolar depression is the affected neural circuits involving the basal ganglia and the prefrontal area.

Physiotherapy treatment is prescribed as a preventive measure (3-5 sessions a day) in the eve of the expected state of deterioration.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	1-10 (P1-mode)	UST - 5 per zone, MLT - 10 per zone, 30 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

Number of treatments: 3-5 sessions on the eve of the expected deterioration.

Possible combination with other treatments:

- Drug therapy;
- Physical therapy;
- Balneotherapy;
- Psychological correction.

Methods of exposure: a stable or labile on the recommended zone.

Within one session exposure is performed simultaneously on three zones by these factors.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

UST - Zone 17 (the projection of the liver);

- Area 25 (D9-10 vertebral segments projection).



MLT Rd - Zone 3 (the eye);

- Zone 1 (embryological projection of epiphysis);

- Area 7 (projection of UCSG);

- 10a area (palmar surface of the right hand);

- Area 11 (cubital fossa on the right / left).

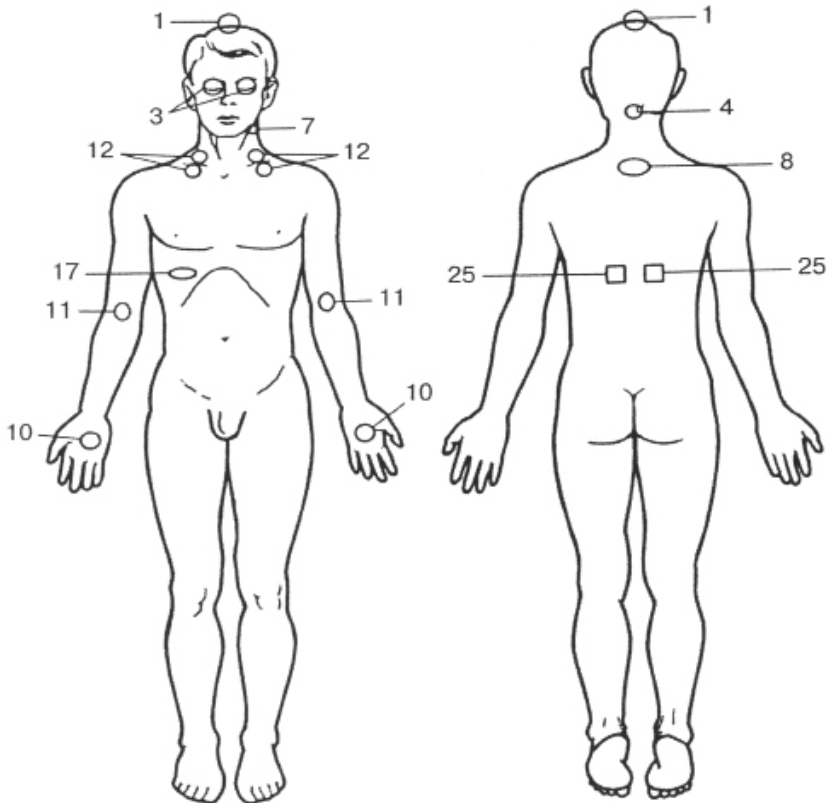
MLT IR - Zone 8 (C8-D2 vertebral segments projection);

- Zone 4 (the projection of the brain stem);

- Zone 10b (palmar surface of the hand from left);

- Area 12 (over- and subclavian fossa).

Influence zones		
US	MLT IR	MLT Rd
17; 25	4; 8; 10b; 12	1; 3; 7; 10a; 11



## F40-F48 NEUROTIC, STRESS-RELATED AND SOMATOFORM DISORDERS

The main feature is repeated presentation of physical symptoms together with persistent demands of medical examinations, in spite of repeated negative results and the assurances of doctors that the symptoms have no somatic nature. If the patient has any physical illness, they do not explain the nature and extent of symptoms, or suffering, or patient complaints.

### **Etiopathogenesis**

Causes: stressful stimuli, traumatic brain injuries, infections, intoxication, diseases of internal organs and endocrine glands, as well as the long-term lack of sleep, fatigue, malnutrition and prolonged emotional stress. Neurosis is the result of a collision of conflicting incentives that create a situation of uncertainty of reflex response; thus, clinic is the result of conflict between the impulses. Somatoform disorders are explained by the activation of neuro-visceral connections that include neurosis somatization.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	2-5	UST - 5 per zone; MLT - 5 per zone, 20 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily or every other day.

The number of procedures: 10.

Possible combination with other treatments:

- Balneotherapy;

- Psychological correction.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST ultrasonic gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

### **METHODS:**

On-vein irradiation of blood on the carotid arteries (zone 11), the frequency of

2-5 Hz, 5 minutes on each side, one time every 2-3 days, 5-7 procedures. With this daily: zone 15 (frequency 75 Hz, time -1 min); Zone 8 (1 min); Zone 4 (8 sec); Zone 5 (20 sec); zone 17 (2.5-3 minutes). Course - 21 days.

UST - Zone 17 (the projection of the liver).

MLT Rd - Zone 15 (the projection of the thymus gland);

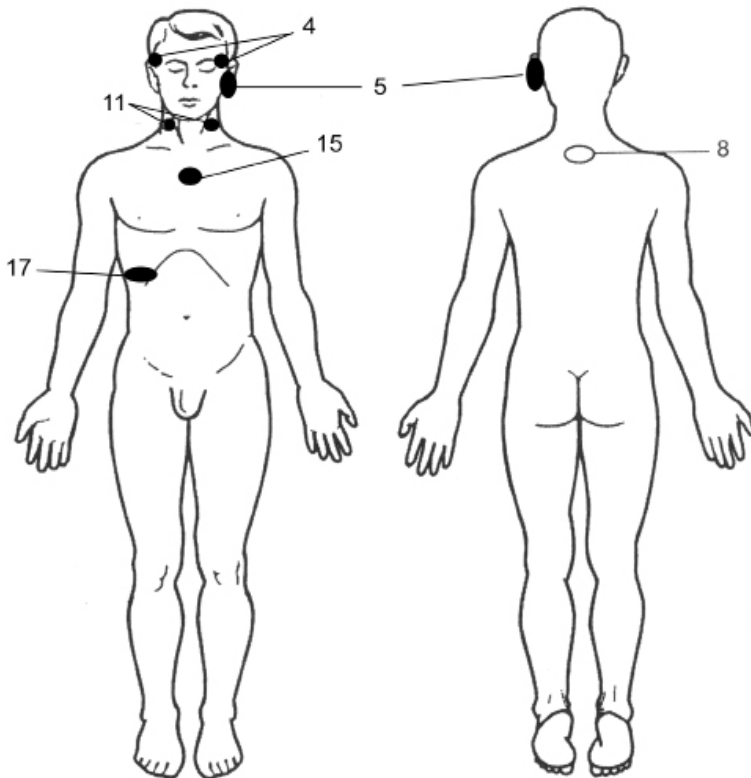
- Area 11 (the projection of the carotid artery on the right / left).

MLT IR - Zone 8 (C8-D2 vertebral segment projections);

- Zone 4 (temporal area to the right / left);

- Zone 5 (Left auricle).

Influence zones		
US	MLT IR	MLT Rd
17	4; 8; 5	15; 11



## E65-E68 OBESITY AND OTHER TYPES OF HYPERNUTRITION

**Obesity** is the chronic recurrent disease which is characterized by the excess content of fatty tissue in an organism (men have not less than 20%, women have 25% of body weight, an index of body weight more than 25-30).

### **Etiopathogenesis**

According to modern concepts one of the main pathogenetic mechanisms leading to development of a disease is the energy imbalance consisting in discrepancy between the number of the calories arriving with food, and energy expenses of an organism. Most often it occurs owing to eating disorders: excess receipt of energy with food in comparison with energy expenditure. Undoubtedly is the value lipoprotein lipase of adipocytes activity in mechanisms of obesity development. At overeating the brown fatty tissue hypertrophies, turning the excess of the energy arriving with food into heat and by that interfering with its adjournment in fatty depots. Small physical activity or lack of adequate physical activity, creating excess of energy in an organism, also promotes increase in body weight. The role of hereditary and constitutional predisposition is undoubted.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	9.4 alternated with 1-10 (P1 mode)	UST - 5 per zone, MLT - 10 to zone; 30 cumulatively.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Methods of exposure: labile on the recommended area.

Frequency of treatments: daily, alternate between morning and evening hours.

Number of treatments: 10.

Possible combination with other treatments:

- Physical therapy;
- Diet therapy;
- Balneotherapy;
- Psychological correction.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

In one session use the 3-4 zones with the following parameters.

UST - Zone 21 (the projection of the celiac plexus);

- Area 26 (D5- D8 paravertebrally projection zone of segmental innervation of the pancreas).

MLT Rd - Zone 3 (the eye);

- Area 37 (the lower third of the internal surface of the tibia);

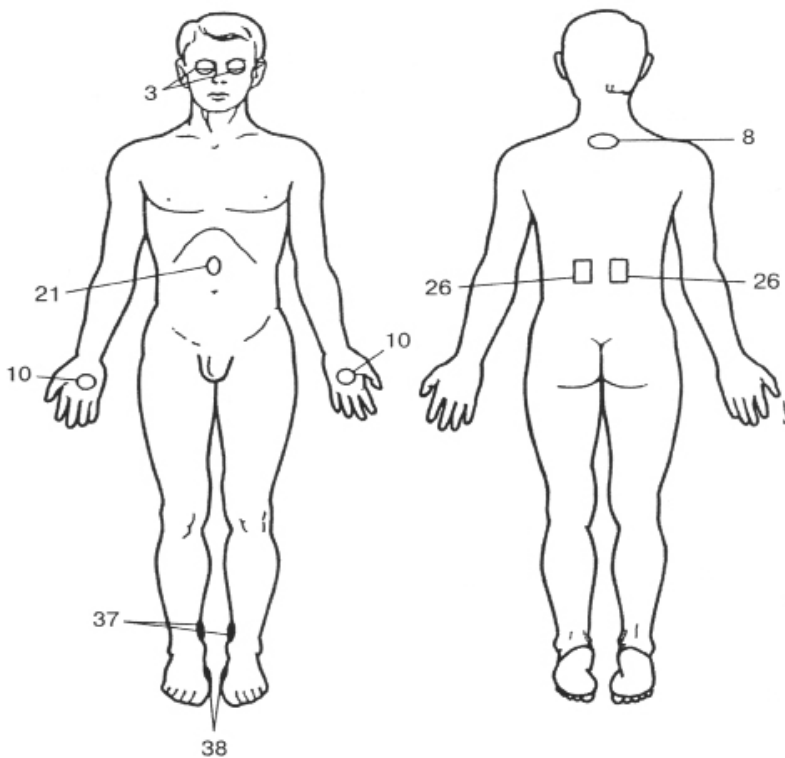
- Area 38 (the inner surface of the feet);

- Zone 10a (palmar surface of the hand on the right).

MLT IR - Zone 8 (C8-D2 vertebral segments projection);

- Zone 10b (palmar surface of the hand on the left).

Influence zones		
US	MLT IR	MLT Rd
21; 26	8; 106	3; 37; 38; 10a



## F01.1 MULTI-INFARCT DEMENTIA

**Dementia** is a persistent decline in cognitive abilities of the person, as well as the gradual loss of learned earlier knowledge.

### **Etiopathogenesis**

The causes of dementia and related disorders are very different. But it is possible to allocate the basic - neuronal death under the influence of deposits formed in the brain. As a result, any suppression of the activity of neurons, or the disruption of the vessels, their feeding.

The causes of senile dementia can be different, moreover, are often found mixed forms of the disease. In addition, the likelihood of developing the disease is affected by adverse factors, the main ones are: age, gender - according to statistics, among the patients more often are women, genetic predisposition.

Also the lack of intellectual activity, stresses, intoxications, alcoholism can exert impact on probability of development of dementia.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	9.4 alternated with 1-10 (P1 mode)	UST -up to 7 per zone MLT -10 per zone, 30 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: daily, morning.

Number of treatments: 14-15.

Possible combination with other treatments:

- Drug therapy;
- Diet therapy;
- Kinesitherapy.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

In one session, use the 3-4 zone with the following parameters.

UST - Zone 17 (the projection of the liver).

MLT Rd - Zone 3 (the eye);

- Zone 6 (projection of the carotid artery);

- Area 36 (the plantar surface of the foot);

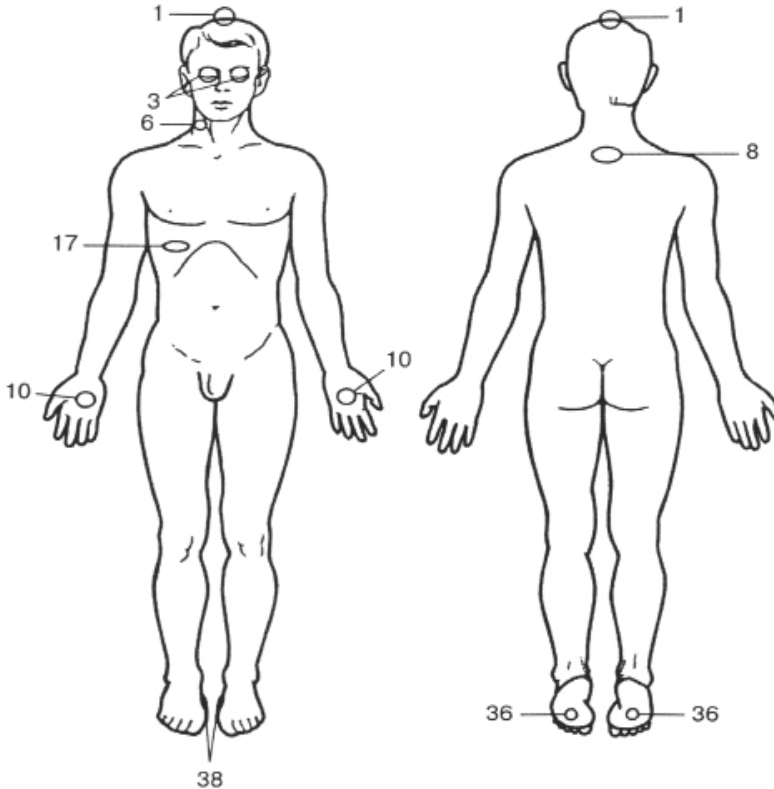
- Area 10 (palmar surface of hands);

- Area 38 (the inner surface of the stop).

MLT IR - Zone 1 (projection of epiphysis);

- Zone 8 (C8-D2 vertebral segments projection).

Influence zones		
US	MLT IR	MLT Rd
17	8; 1	3; 6; 36; 38; 10



## I 15 VEGETATIVE DYSTONIA (VD) ON HYPERTENSIVE TYPE

**The vegetative-vascular Dysfunction (VD)** is the designation of widespread in medical and diagnostic practice but various by origin and manifestations, the functional vegetative frustration in the basis caused by violation of neuro humoral regulation of vegetative functions.

### **Etiopathogenesis**

These disorders are most frequently observed in the neuroses, physical inactivity, with endocrine disharmony in puberty and menopause, as well as neurosis conditions associated with neuro-mental or physical fatigue, infections, intoxication, withdrawal symptoms in drug addicts and other nature.

In the pathogenesis of VD usually involved the regulation of autonomic disorders at all levels - from the cerebral cortex to the peripheral parts of the autonomic nervous system (adrenergic and cholinergic receptors include executive bodies) and regulation of endocrine links.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	12 alternated with 1-10 (P1 mode)	UST - 5 per zone, MLT - 10 per zone, 30 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: every other day.

Number of treatments: 10.

Possible combination with other treatments:

- Drug therapy;
- Balneotherapy;
- Physical therapy;
- Psychological correction.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

In one session, use the 3-4 zone with the following parameters.



UST - Zone 21 (the projection of the celiac plexus).

MLT Rd - 36a Zone (the plantar surface of the foot to the right);

- 10a area (palmar surface of hands on the right).

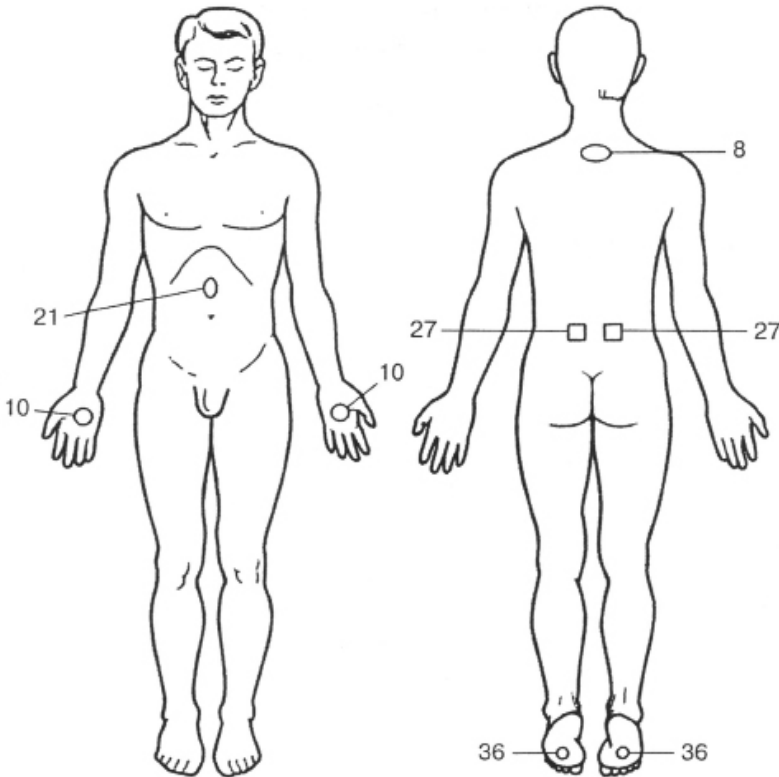
MLT IR - area 36b (the plantar surface of the foot to the left);

- Zone 10b (palmar surface of hands on the left);

- Zone 8 (C8-D2 vertebral segments projection);

- Area 27 (D12-L2 paravertebrally projection area of segmental innervation of the kidney).

Influence zones		
US	MLT IR	MLT Rd
21	8; 27; 106; 366	10a; 36a



## G21 PARKINSON'S DISEASE

**Parkinson's disease** is a neurologic syndrome which is characterized by a number of symptoms: a tremor, a muscular rigidity (the steady increase of a muscular tone, uniform resistance of muscles in all phases of the passive movement which is equally expressed in flexors and extensors), postural instability (inability to keep balance, difficulties of walking, falling) and a bradykinesia (a slow rate of movements, difficulty of initial movements, difficulty of turns).

### **Etiopathogenesis**

Clinical manifestations of trembling paralysis and syndrome of parkinsonism result from the postponed acute and chronic infections of nervous system. Cerebral atherosclerosis, brain vascular diseases, tumors, traumas of nervous system can serve as etiologies. The main pathogenetic link is violation of the metabolism of catecholamines (dopamine, noradrenaline) in extrapyramidal system.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	9.4 alternated with 1-10 (P1 mode)	UST - 5 per zone, MLT - 10 per zone, 30 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: every other day, preferably in the morning.

Number of treatments: 14-21.

Possible combination with other treatments:

- Drug therapy;
- Kinesitherapy.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

In one session, use the 3-4 zone with the following parameters.

UST - Zone 17 (the projection of the liver).

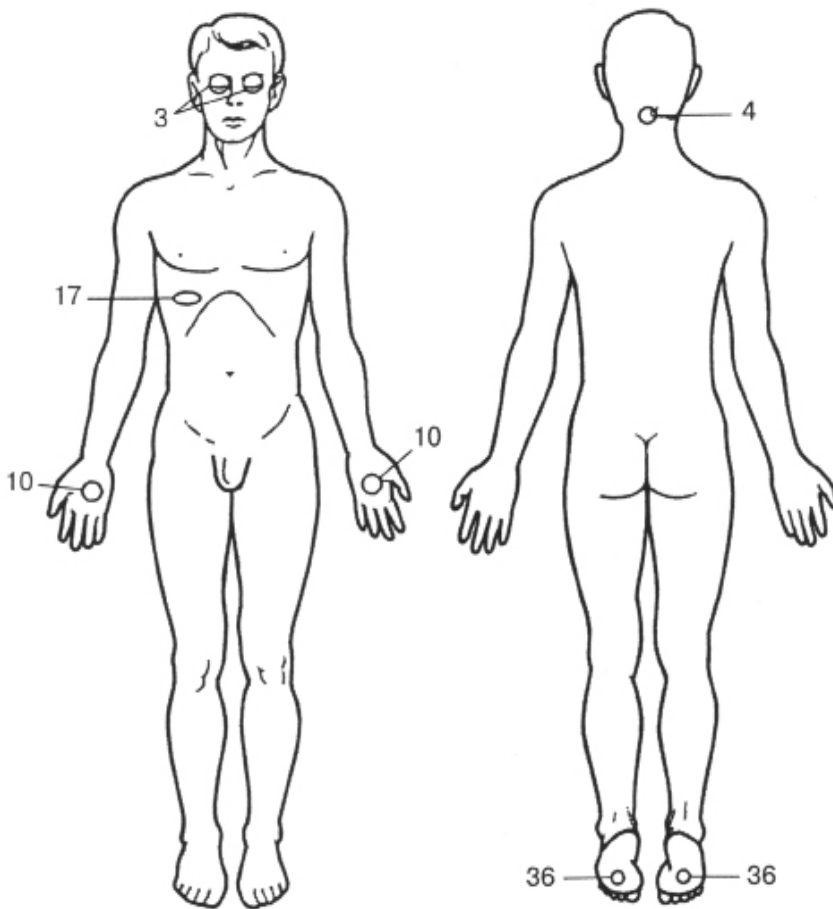
MLT Rd - Zone 3 (the eye);

- Zone 36a (the plantar surface of the foot to the right);
- 10a area (palmar surface of hands on the right).
- MLT IR - area 36b (the plantar surface of the foot to the left);
- Zone 10b (palmar surface of hands on the left);
- Zone 4 (the projection of the brain stem).

**ATTENTION**

*The best results are obtained when the patient is not taking antiparkinsonian drugs.*

Influence zones		
US	MLT IR	MLT Rd
17	4; 106; 366	3; 10a; 36a



## **F90 DYSTONIC HYPERKINESIA (TORTICOLLIS, OROMANDIBULAR DYSKINESIA)**

Dystonic hyperkineses are pathological suddenly arising involuntary movements in various groups of muscles.

### **Etiopathogenesis**

Manifested in the organic and functional lesions of the nervous system: the cerebral cortex, subcortical motor centers or the brain stem. Usually caused by lesions of the basal ganglia and related structures forming extrapyramidal system (extrapyramidal hyperkineses), rarely disorders of the peripheral nervous system (peripheral hyperkineses). Can occur as a side effect of antipsychotic neuroleptic syndrome in the composition (medicinal hyperkineses), due to their toxic effects on the extrapyramidal system.

Often arise against infectious diseases (encephalitis, rheumatism), vascular encephalopathy; after an undergoing traumatic brain injury, intoxication and others.

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	75-99	10-100 (P2-mode)	UST - up to 7 total; MLT - 10 per zone, 30 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: 2-3 times a week, preferably in the morning.

Number of treatments: 14-15.

Number of courses per year: 3.

Possible combination with other treatments:

- Drug therapy;
- Autogenous training;
- Postisometric relaxation.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata.

In one session, use 3-4 zones with the following parameters.

UST - Zone 17 (the projection of the liver);

- Area 25 (D7-L2 paravertebrally projection of segmental innervation zone of the liver and gall bladder).

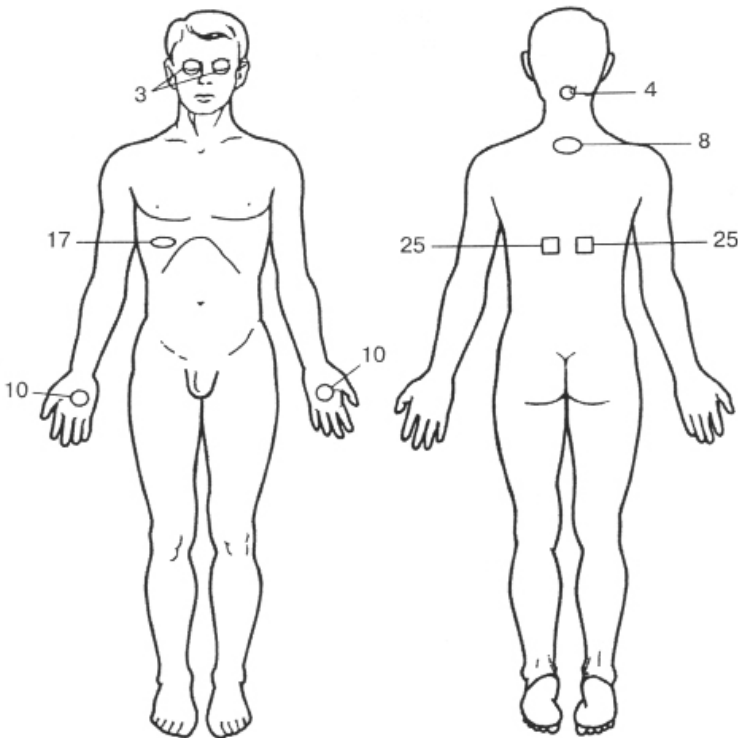
MLT Rd - Zone 3 (the eye);

- Area 10 (palmar surface of hands).

MLT IR - Zone 8 (projection of C7-D2 vertebrae segments);

- Zone 4 (the projection of the brain stem).

Influence zones		
US	MLT IR	MLT Rd
17; 25	4; 8	3; 10



## ***APPLICATION OF MAGNET-LASER ULTRASOUND THERAPY FOR HEALTH IMPROVING AND PREVENTIVE PURPOSES***

### **TREATMENT SCHEME:**

On the front panel of the device set the following parameters of the procedure:

AMPLITUDE US, μm	MLT POWER rel., %	MODULATION, Hz	TIME, min
3-5	50-75-99	9,4	UST - 5 per zone, MLT - 10 per zone, 30 in total.

### **METHOD OF TREATMENT**

Position of the patient - lying.

The position of the radiator: contact.

Frequency of treatments: 2 times a week.

Number of treatments: 5-7.

Number of courses per year: 2-3.

Possible combination with other treatments:

- Physical therapy;
- Harding;
- Massage.

Methods of exposure: a stable or labile on the recommended zone.

UST is conducted directly on a body or through a contact medium (UST gel, cocoa butter or other plants, drug, etc.).

MLT is carried out simultaneously with a contact UST. Inductors are mounted on the projection of pathological focus in the area of paravertebral or reflex zones and the zone of the medulla oblongata. In one session, use the 3-4 zone with the following parameters.

UST - Zone 17 (the projection of the liver).

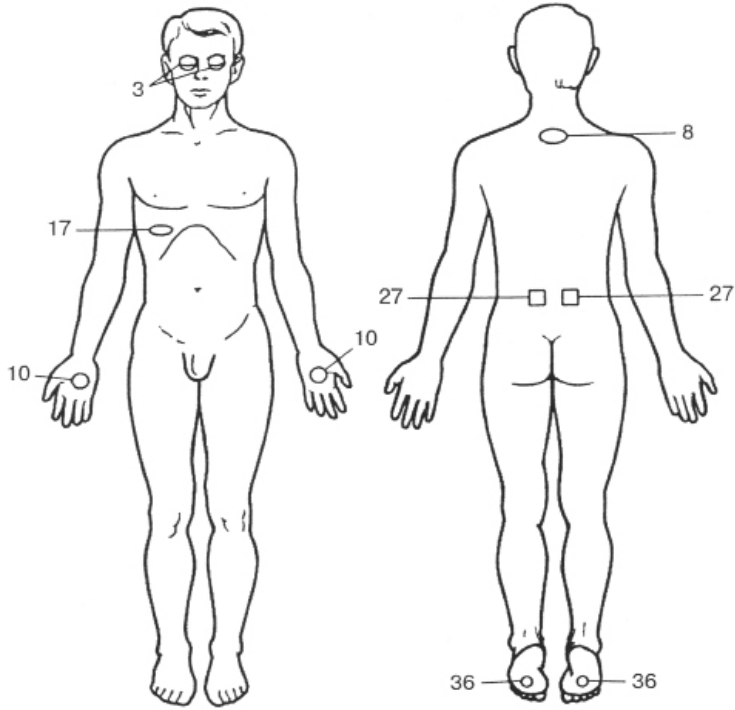
MLT Rd - Zone 36 (the plantar surface of the foot);

- Area 10 (palmar surface of hands).

MLT IR - Zone 8 (projection of C7-D2 vertebrae segments);

- Area 27 (paravertebrally projection of D11-L1 segmental innervation of the kidney area).

Influence zones		
US	MLT IR	MLT Rd
17	27; 8	36; 10



## **Annex 1.**

### **TREATMENT OF PATIENTS AND DISABLED PEOPLE WITH DISCOGENIC DORSOPATHIES ON THE BACKGROUND OF ANXIOUS DEPRESSION**

According to WHO experts degenerative diseases of a backbone with pain syndrome in 2015 reached the pandemic sizes. In the majority of economically developed countries prevalence of this disease reaches 40-80% at adult population, and annual incidence in the majority of the countries exceeds the level of 5%. One of the main causes of back pain is a herniated disc (HD) or displacement of the deformed intervertebral disc in the intervertebral foramen or spinal canal that causes compression of the corresponding root, dural sac, vascular structures, which leads to the development of pain. At the same time painful manifestations can be in the area of the affected backbone segment, however most often they irradiate in distal departments of the lower extremity. Pain syndromes arise, as a rule, at dynamic vertical loadings or at loads of a backbone in a curved or rotational state. In the majority of cases pain syndromes of this kind become as an invalidating factor for the patient.

According to the international recommendations, dorsopathies are classified on three groups:

- the deforming dorsopathy - the pathological deformations of a spine column caused by dystrophic changes in intervertebral disks (without violation of integrity of a fibrous ring, without protrusions and hernias of a pulpal nucleus). This group of diseases include: scoliosis, lordosis, kyphosis, spondylolisthesis, spondylolysis and osteochondrosis;
- spondilopathies - all types of traumatic, degenerative and inflammatory spondilopathy;
- other dorsopathies are diskogenic dorsopathies with the progressing degenerate and dystrophic changes in intervertebral disks with a protrusion, intervertebral hernias, and also different types of dorsalgias, i.e. pain syndromes in neck, trunk and extremities without the shift of intervertebral disks, without abnormalities in the spinal nerve roots or the spinal cord.

In the researches conducted by authors only diskogenic dorsopathies were considered.

For better understanding the technique developed by authors we will stop on a structure of the main object of research – a human backbone. It consists of vertebrae between which are located intervertebral disks. Intervertebral disks give the chance to a backbone to make the rotational and inclined movements, provide depreciation and act like «shock absorber» of vertebrae during the movement and physical exercises.



The intervertebral disk consists of rather rigid external fibrous ring (annulus fibrosus) and a soft elastic internal kernel (pulpal nucleus). When developing hernia of an intervertebral disk (Fig. 15), as a rule, there is a gap or deformation of the fibrous ring and in this case the small part of a pulpal nucleus is displaced outside, making the compression squeezing of spinal cord or nervous root. So the pain syndrome in a zone of emergence of HD develops and leads to emergence of back pain sensation.



*Fig. 15 Developing of intervertebral disks hernia.*

At the first stage (till 2 months after the last aggravation) complex conservative treatment is carried out. At the second stage, in case of inefficient conservative treatment and at a disk protrusion of more than 6 mm checked by a computer tomography, according to the recommendation of the International Association about Studying of Pain, microdiscectomy of herniated disc by W. Casper technology is carried out. Today it is the «gold standard» in the treatment of such diseases.

In recent years the tendency to minimization of surgical interventions among which it should be noted a microdiscectomy with endoscopic assisting is observed. Positive results after microdiscectomy make 95-97%. However surgical intervention is directed only to elimination of a local problem and the emergence and developments of pathology does not remove the cause. Probably the most effective in treatment of diskogenic dorsopathies would be at the first stage the application of technologies that provide medical treatment on the basis of physiological approaches that would allow to carry out at later stage a microdiscectomy and additionally enter the third stage – recovery treatment after operation and prevention of repeated emergence of DH, including physiotherapeutic treatment, stage-by-stage increase the load on the backbone and training of the patient in the correct movement, need of the prevention of backbone overloads and formation of paravertebral muscular framework on a basis of individually developed complex of physical exercises [4-7].

Modern requirements to medical protocols implementation of diskogenic dorsopathy pain syndromes treatment assume the need of use the innovative

technologies allowing to reduce medicamentous loading, providing the maximum restoration of violations of organs or functional systems work; to accelerate processes of recovery treatment and to improve quality of life of patients taking into account restoration of their psychological state [1-3].

For this purpose authors performed the research work on estimation of physiotherapeutic treatment efficiency of pain syndromes in patients with diskogenic dorsopathy against a disturbing depression. At the same time the main attention was paid to the development of protocols and researches of system approach efficiency in physiotherapeutic treatment and correction of a disturbing depression at patients with DH against disturbing and depressive frustration.

Treatment was carried out on the basis of the offered techniques [7-11]. For definition of the most effective protocol of treatment the patients with DH were selected 90 patients who were in a random way divided into 5 groups. The presence of DH and disturbing depressive frustration, and also information consent to participation in research was the main criteria for inclusion in the studied group of patients. By this moment 90 patients with the diagnosis of intervertebral hernias of lumbar department against a disturbing depression were examined and received the treatment. All patients were on out-patient treatment. The group included patients of 25-65 years of age, including 44 women and 46 men. Patients were distributed in a random way on five groups. Quantity of the investigated in groups: 1 group - 19 patients; the 2nd group - 20; 3d - 5th groups each had 17 patients.

1-st group – treatment was carried out on the basis of the approved protocol of treatment of a diskogenic dorsopathy - local introduction of antipainful preparations on DH projection by method of an ultraphonophoresis in combination with the subsequent magnetic laser therapy. This group was defined as control. In all other groups it was carried out similar treatment with additional introduction to the program:

2-nd group - endonasal breathing of singlet-oxygen mixture.

3-d group - pulse micro-polarization of cerebral cortex.

4-th group - pulse magnet-laser therapy of cerebral cortex.

5-th group - a kinesitherapy in a condition of backbone decompression in a constant magnetic field.

All patients settled down in a condition of backbone decompression on a couch «Harmony» fixed at an angle 150° to the horizon. Permanent magnets (Fig. 16) are established in a mattress of a couch paravertebral to the field of the backbone.

Local introduction of antipainful preparations on DH projection was carried out by method of an ultraphonophoresis with use of the device MIT-31. Procedure parameters: frequency of ultrasonic fluctuations – 44 kHz, frequency of repetition of packs of ultrasonic fluctuations – 9,4 Hz, porosity of packs – 2, amplitude of ultrasonic fluctuations – 2 microns, carrying out technique – labile. Time of introduction of a preparation – 5 minutes. In addition, on a zone of introduction of a preparation, the

procedure of magnet-laser therapy was carried out. Procedure parameters: frequency of impulses repetition of 9,4 Hz, magnetic induction on a surface of the inductor  $25\pm 5$  mTl, the power of an optical stream –  $20\pm 5$  mW, the wavelength of an optical stream –  $780\pm 50$  nanometers, procedure time – 10 minutes, a technique of carrying out procedure – motionless.



*The fig. 16 Location of the patient on the couch while the procedures*

Parameters of procedure of endonasal breathing of singlet-oxygen mixture: the device MIT-S, the mixture volume created in 1 minute – 2 liters, duration of one procedure – 15 minutes. The course of treatment consisted of 12 procedures which were carried out 3 times a week.

Parameters of procedure of pulse micro polarization of cerebral cortex: the device MIT-EF2, frequency of impulse repetition  $9.4\pm 0.94$  Hz, duration of an impulse equaled 0,5 ms, current was established until the emergence of easy feeling of electric current, time of one procedure – 15 minutes, 12 procedures were appointed to a course of treatment, procedures were carried out 3 times a week. Electrodes of 1 channel were established on the right side: «+» in the mastoid area, «-» on the brow arch. Electrodes of 2 channel were established similarly on the left side.

Parameters of procedure of pulse magnet-laser therapy of brain bark: the device MIT-31 MT or MIT-31, frequency of repetition of impulses – 9.4 Hz, the magnetic induction on a surface of the inductor was  $25\pm 5$  mTl, the power of an optical stream of red range of radiation –  $30\pm 5$  mW, the power of an optical stream of an infrared

range of radiation –  $50 \pm 5$  mW, time of one procedure was determined – 15 minutes, 12 procedures were appointed to a course of treatment, procedures were carried out 3 times a week. The magnet-laser inductor of an optical stream of red range of radiation was installed on a zone between brow arches. The magnet-laser inductor of an optical stream of infrared range was installed on a zone of a big occipital opening. The course of treatment consisted of 12 procedures; procedures were carried out 3 times week.

Procedure of a kinesitherapy was carried out on a couch «Harmony» in a condition of backbone decompression in a constant magnetic field. In dependence on a condition of the patient exercises with the half bent or bent knees were carried out. The patient lying on a couch. Fixing of the patient was carried out by means of a special belt or by keeping himself with hand-rail by hands. Legs were transferred to a half bent state with the subsequent inclination to the right and then to the left. For one procedure 9-15 movements were carried out. One full movement was carried out within 30-60 seconds.

The offered set of exercises provided the rotational movements of vertebrae and, respectively, increased the microcirculation of liquid in intervertebral disks. Amplitude of raising and a corner of their turn were defined by a condition of the patient, physical capacity and his readiness for exercises performance. Contraindication to carrying out exercises was the acute pain. If necessary, the exercises were carried out with the support of an instructor in physical rehabilitation or physiotherapist doctor. Variant of the exercises presented on Figure 17.

Model of the research included clinical and neurological assessment of patients, determining the intensity of pain on the scale (the scale of assessments of the status of the autonomic nervous system, the scale of assessment of quality of life SF-36, VAS scale) before and after treatment, the dynamic of general clinical analyzes, performed rheovasography to determine, if necessary, venous blood flow in the lower extremities and the corresponding magnetic resonance imaging of spine. To assess the level of anxiety and depressive disorders, the psychometric table of Beck and Spielberger-Hanin were used [2].



*The fig. 17 Option of carrying out exercises at DH*

### ***Results and their discussion.***

The clinical picture was typical before the treatment. The main symptom in patients with DH was pain. Prior to treatment all indicators estimated by patients on VAS were close to uniform in all groups of patients.

Results of our researches showed positive dynamics of clinical manifestations in all groups of patients. After the analysis of the obtained data it was established that the combination of ultraphonophoresis of antipainful preparations and magnet-laser therapy of DP in combination with a micro-polarization of a cerebral cortex reduced clinical manifestations of pain by 42-49% and reduced indicators of uneasiness and a depression almost twice. At such combination of physiotherapeutic procedures more expressed positive dynamics of symptoms of vegetative dysfunction was observed, there was reduction of pain syndrome that, in turn, promoted the improvement of quality of life of this category of patients. Use of questionnaire SF-36 allowed to register and to quantitatively estimate life quality changes of patients before the carried-out treatment, and also to allocate factors defining qualities of life of the patient that had more exert impact on mental and physical components.

By results of the analysis of answers to questions of the SF-36 tests at patients in all groups the improvement of physical (PF) and role physical (RP) functioning, the general health (GH), vital activity (VT), emotional functioning (RE), reduction of pain (BR) was observed. Reduction of muscular-tonic and especially pain syndrome under the influence of the carried physiotherapeutic treatment led to considerable improvement of an emotional condition of patients and decrease in level of depression. According to the obtained data the quality of life of patients as a result of the conducted course

of treatment increased, especially on scales of painful sensitivity. It can be explained with the fact that decrease in level of pain substantially lifts limits for performance of daily work, leads to possibility of increase in volume of the performed works, improvement of work performance quality. At 3 group patients' indicators were the highest in comparison with other studied groups of patients. Dynamics of change of data by VAS is given in Fig. 18.

As a result of application of physiotherapeutic treatment subjective improvement on VAS was noted by all patients. By results of the analysis of the obtained data the better indicators of treatment of pain syndromes at the sick diskogenic dorsopathy against a disturbing depression was reached in the 3rd group.

The condition of level of disturbing and depressive frustration was estimated on the basis of scale of situational and personal uneasiness of Spielberg-Hanin and Beck's depression. Results of inspection are given in Fig. 19 and Fig. 20 respectively.

Having made the analysis of the received research results, we received that the most effective protocol of treatment of pain syndromes at patients with a discogenic dorsopathy against a disturbing depression is the combination of local introduction of the preparation «Karypain» by method of an ultraphonophoresis in combination with zone magnet-laser therapy in a condition of backbone decompression in constant magnetic field and additional carrying out correction of disturbing and depressive frustration on the basis of application of micro-polarization of cerebral cortex at a frequency a alpha rhythm ( $9.4 \pm 0,94$  Hz), what considerably strengthens therapeutic effect of treatment of pain and effectively reduces the level of disturbing and depressive frustration at patients of this group.

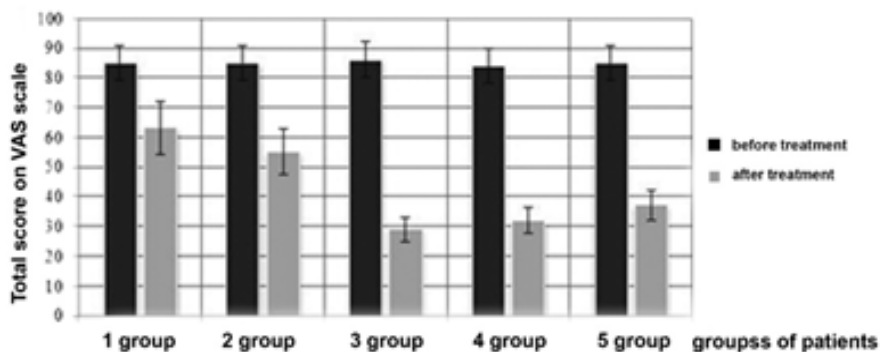


Fig. 18. Dynamics of change of a pain syndrome on a VAS scale

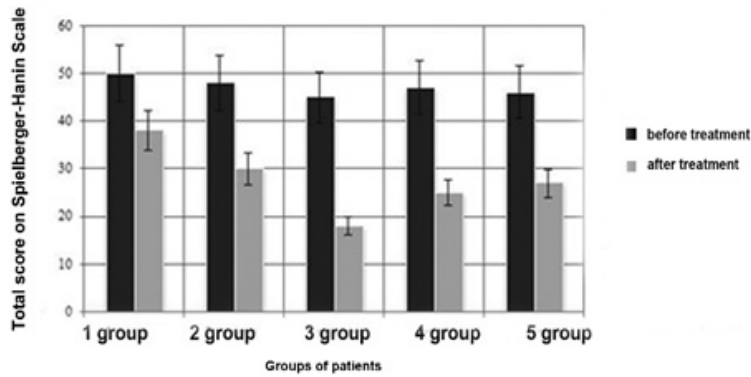


Fig. 19 Alarm level on result of poll on Spilberger-Hanin's scale

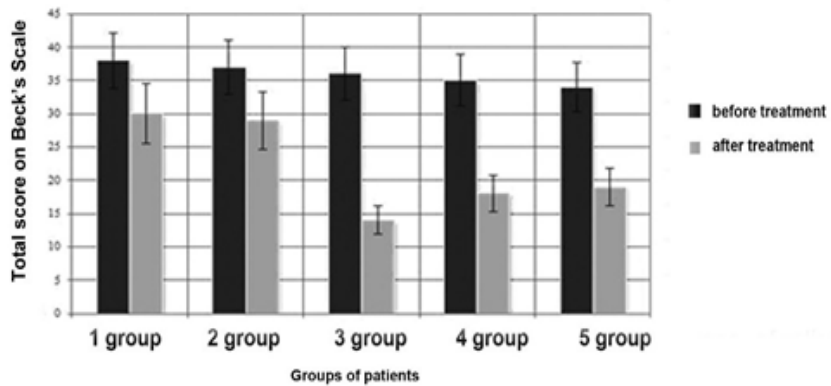


Fig. 20 Depression level at patients (on result of Beck scale)

Topical is the further study of the combined use of physical therapy treatment of pain syndromes and correcting anxiety and depressive disorders in patients with discogenic dorsopathy on the background of anxious depression to improve the effectiveness of the overall treatment.

## ANNEX 2.

### WAYS OF ASSESSMENT OF PSYCHOLOGICAL FRUSTRATION LEVEL AT PATIENTS AND DISABLED PEOPLE

#### *Beck's Scale of an assessment of level of depression.*

The scale of Beck's depression level assessment (Beck Depression Inventory) is used for diagnostics of level of a depression. The method is offered by Aaron T. Beck in 1961 on the basis of the clinical supervision which allowed revealing the list of symptoms of a depression.

This questionnaire contains groups of statements. Attentively read each group of statements. Then define in each group the one statement which best of all corresponds to how do you feel this week and today. Put a tick in front the chosen statement. If several statements from one group seem to you equally well suitable, then put ticks about each of them. Before you make the choice, be convinced that you read all statements in each group.

1.
  - 0 I do not feel sad.
  - 1 I feel sad
  - 2 I am sad all the time and I can't snap out of it.
  - 3 I am so sad and unhappy that I can't stand it.
2.
  - 0 I am not particularly discouraged about the future.
  - 1 I feel discouraged about the future.
  - 2 I feel I have nothing to look forward to.
  - 3 I feel the future is hopeless and that things cannot improve.
3.
  - 0 I do not feel like a failure.
  - 1 I feel I have failed more than the average person.
  - 2 As I look back on my life, all I can see is a lot of failures.
  - 3 I feel I am a complete failure as a person.
4.
  - 0 I get as much satisfaction out of things as I used to.
  - 1 I don't enjoy things the way I used to.
  - 2 I don't get real satisfaction out of anything anymore.
  - 3 I am dissatisfied or bored with everything.
5.
  - 0 I don't feel particularly guilty
  - 1 I feel guilty a good part of the time. 2 I feel quite guilty most of the time.



- 3 I feel guilty all of the time.
- 6.
- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.
- 7.
- 0 I don't feel disappointed in myself.
- 1 I am disappointed in myself.
- 2 I am disgusted with myself.
- 3 I hate myself.
- 8.
- 0 I don't feel I am any worse than anybody else.
- 1 I am critical of myself for my weaknesses or mistakes.
- 2 I blame myself all the time for my faults.
- 3 I blame myself for everything bad that happens.
- 9.
- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.
- 10.
- 0 I don't cry any more than usual.
- 1 I cry more now than I used to.
- 2 I cry all the time now.
- 3 I used to be able to cry, but now I can't cry even though I want to.
- 11.
- 0 I am no more irritated by things than I ever was.
- 1 I am slightly more irritated now than usual.
- 2 I am quite annoyed or irritated a good deal of the time.
- 3 I feel irritated all the time.
- 12.
- 0 I have not lost interest in other people.
- 1 I am less interested in other people than I used to be.
- 2 I have lost most of my interest in other people.
- 3 I have lost all of my interest in other people.
- 13.
- 0 I make decisions about as well as I ever could.
- 1 I put off making decisions more than I used to.
- 2 I have greater difficulty in making decisions more than I used to.

- 3 I can't make decisions at all anymore.
- 14.
- 0 I don't feel that I look any worse than I used to.
- 1 I am worried that I am looking old or unattractive.
- 2 I feel there are permanent changes in my appearance that make me look unattractive
- 3 I believe that I look ugly.
- 15.
- 0 I can work about as well as before.
- 1 It takes an extra effort to get started at doing something.
- 2 I have to push myself very hard to do anything.
- 3 I can't do any work at all.
- 16.
- 0 I can sleep as well as usual.
- 1 I don't sleep as well as I used to.
- 2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
- 3 I wake up several hours earlier than I used to and cannot get back to sleep.
- 17.
- 0 I don't get more tired than usual.
- 1 I get tired more easily than I used to.
- 2 I get tired from doing almost anything.
- 3 I am too tired to do anything.
- 18.
- 0 My appetite is no worse than usual.
- 1 My appetite is not as good as it used to be.
- 2 My appetite is much worse now.
- 3 I have no appetite at all anymore.
- 19.
- 0 I haven't lost much weight, if any, lately.
- 1 I have lost more than five pounds.
- 2 I have lost more than ten pounds.
- 3 I have lost more than fifteen pounds.
- 20.
- 0 I am no more worried about my health than usual.
- 1 I am worried about physical problems like aches, pains, upset stomach, or constipation.
- 2 I am very worried about physical problems and it's hard to think of much else.
- 3 I am so worried about my physical problems that I cannot think of anything else.
- 21.
- 0 I have not noticed any recent change in my interest in sex.

- 1 I am less interested in sex than I used to be.
- 2 I have almost no interest in sex.
- 3 I have lost interest in sex completely.

### ***INTERPRETING THE BECK DEPRESSION INVENTORY***

Now that you have completed the questionnaire, add up the score for each of the twenty-one questions by counting the number to the right of each question you marked. The highest possible total for the whole test would be sixty-three. This would mean you circled number three on all twenty-one questions. Since the lowest possible score for each question is zero, the lowest possible score for the test would be zero. This would mean you circles zero on each question. You can evaluate your depression according to the Table below.

Total Score \_\_\_\_\_ Levels of Depression

- 1-10 \_\_\_\_\_ These ups and downs are considered normal  
 11-16 \_\_\_\_\_ Mild mood disturbance  
 17-20 \_\_\_\_\_ Borderline clinical depression  
 21-30 \_\_\_\_\_ Moderate depression  
 31-40 \_\_\_\_\_ Severe depression  
 over 40 \_\_\_\_\_ Extreme depression

### ***Scale of situational and personal uneasiness of Spielberger-Hanin***

Read attentively each of the offers given below and cross out the corresponding figure depending on that, how do you feel on the right at present. Answer the first that came to mind.

№		Answers			
		No, it is not so	Perhaps so	Right so	Exactly
1	I am quiet	1	2	3	4
2	Nothing threatens me	1	2	3	4
3	I am in tension	1	2	3	4
4	I feel internally down	1	2	3	4
5	I feel freely	1	2	3	4
6	I am upset	1	2	3	4
7	I am concerned by possible failures	1	2	3	4
8	I feel peace of mind	1	2	3	4
9	I am alarmed	1	2	3	4

10	I have feeling of internal satisfaction	1	2	3	4
11	I am self-assured	1	2	3	4
12	I am nervous	1	2	3	4
13	I cannot find any peace	1	2	3	4
14	I am excited	1	2	3	4
15	I do not feel constraint, intensity	1	2	3	4
16	I am happy	1	2	3	4
17	I am anxious	1	2	3	4
18	I am very excited and feel bad	1	2	3	4
19	I'm joyful	1	2	3	4
20	I am pleased	1	2	3	4

### *Scale of personal uneasiness*

Read attentively each of the offers given below and cross out in the corresponding column depending on that, how do you feel usually, a certain figure on the right. Do not think for a long time on questions as there are no correct or wrong answers.

№		Answers			
		Never	Almost never	Often	Almost always
1	Raised mood happens at me	1	2	3	4
2	I am irritable	1	2	3	4
3	I can easily be upset	1	2	3	4
4	I would like to be same successful as well as others	1	2	3	4
5	I strongly worry about troubles and I cannot forget about them for a long time	1	2	3	4
6	I feel inflow of forces, desire to work	1	2	3	4
7	I am calm, cool and Collected	1	2	3	4
8	I am disturbed by possible difficulties	1	2	3	4
9	I too worry because of Trifles	1	2	3	4
10	I am quite happy	1	2	3	4
11	I take everything very much to heart	1	2	3	4
12	I lack self-confidence	1	2	3	4
13	I feel defenseless	1	2	3	4















**Annex 4.**  
**Apparatus recommended for MLUST procedures and combined use**  
**with other physiotherapy methods.**  
**«HARMONY» system**



The system «Harmony» is designed for dry horizontal traction of the spine (in the lumbosacral and cervical regions), using an adjustable electric couch and pneumopressing. The installation consists of:

- Couche (2100 \* 1070 \* 830mm) with electric drive, controlled by remote control;
- Thoracic bodice;
- Segmental air mattress.

1. Traction is carried out in a room at a temperature 20-22°C. Before the procedure is recommended to perform a back massage for 10 minutes, then, after which the patient wear the chest belt and is laid on the couch.

2. Chest belt with the help of straps and detachable ring is attached to the tab located at the head on the back of the couch.

3. Pneumatic segmental mattress is activated for 5-7 minutes before starting the procedure. During this time it is completely filled with air, and during the procedure deflates and inflates in segments (by segment).

4. Using the remote couch slope changes from a horizontal position into an oblique angle of 45 degrees.

5. Thus, the patient lies on an inclined plane, thoracic spine is fixed a belt attached to the back of the couch. Procedures are held without loads.

6. Traction is held under its own weight and pneumopressing. At the same time in dosing of procedure is taken into account the weight, sex and age of the patient.

7. Throughout the session extension is necessary to control the tension of the sling pectoral girdle on both sides, the patient's state of health, portability procedure (you can offer the patient to move his feet, according to the «Cycling», or move your feet to the right and to the left, at the same time informing the sensations).

According to this information to decide whether to increase / decrease the load or premature termination of the procedure.

8. The termination of procedure is performed by turning off the release sling pectoral girdle.

9. Immediately after the stretching of procedure for stabilization of the spine, the patient needs to rest on a horizontal couch for at least 20 minutes.

A combined method of treating musculo-articular and traction machine pneumopressing patient results in improved peripheral circulation and normalization of muscle strength and tone, provides a maximum relaxation of the affected muscles and associated stretching effect providing decompressed neurovascular structures and high therapeutic effect.

Indications: lumbosacral radicular syndrome caused by a degenerative process in the intervertebral discs in the process of return of development and the stage of incomplete remission with static-dynamic disorders (restriction of range of motion in the lumbar spine, scoliosis, kyphoscoliosis, stress the long muscles of the back, flattening of lordosis and etc.), with a weakly to moderately severe pain.

Contraindications: acute stage of the disease, scar-adhesions epiduritis, violation of the spinal cord blood flow, phenomena of irritation of the spinal cord membranes (arachnoiditis). Sciatica with concomitant diseases of the abdominal cavity (cholecystitis, peptic ulcer and duodenal ulcer, pochechno- and cholelithiasis, omission of kidneys, gallbladder stones, scar processes in the abdominal cavity).

### Combined physiotherapy apparatus MIT-31



Physiotherapy apparatus combined MIT-31 for treating patients with low-frequency ultrasound (US) and a pulse magnetic field in combination with the optical flow and infrared red (or blue) spectrum (MLT).

Ultrasound is a unique physical factor that provides for micro cell and tissue level, which leads to an increase in the microcirculation of exposure and increase the rate of biochemical reactions. The magnetic field in combination with the optical flow (MLT) has a pronounced analgesic, anti-inflammatory and immunomodulatory effects.

In addition to the unique combination of these factors, the machine MIT-31 provides:

- the possibility of a three-level principle of the impact, i.e. simultaneous action on the central nervous system (projection medulla), the peripheral nervous system (spinal segment) and on the body itself or a projection;

- principle of resonant effects on body or functional system as a whole.

Advantages of the combined effects of ultrasound and MLT are expressed in:

- increase the effectiveness of treatment;
- no allergy or intolerance;
- activation of the body to fight the disease,

launching and promoting mechanisms sanogenesis;

- significant reduction in dosing of drugs, etc.

The most effective use of the device for the treatment of:

- painful syndromes and inflammatory processes;
- respiratory diseases;
- digestive disorders, biliary tract;
- diseases of the cardiovascular system;
- diseases of the musculoskeletal system;
- endocrinological diseases;
- gynecological and urological diseases;
- ENT diseases.

### **Apparatus for physiotherapy combined MIT-31 MT**



Apparatus for magnetic therapy combined, «MIT-31 MT» is used for the treatment by low-intensity magnetic field and / or zonal magnetic quantum effects on the resonant frequencies of organs or systems.

The device is used for the treatment

of various diseases, which are based on a violation of the immune and endocrine systems of local blood circulation, swelling, pain syndromes, inflammatory processes and a number of psychosomatic diseases, mainly neuroses and reactive states, especially complicated with sleep disorder. The use of low-intensity magnetic field at the resonant frequencies of the work of human organs has magnetic resonance modulating effect on the immune and endocrine systems and has neuro-reflex and local action. Strengthens processes of protective inhibition in the cerebral cortex, it has a sedative and giposensibiliziruyuschee influence. It helps restore the nervous regulation of respiration, blood circulation and metabolism.

Therapeutic effects of magnetic therapy: vasoactive, anti-inflammatory (anti-edematous), trophic, hypo-coagulating, local analgesic, act-protective.

The device is recommended for application in medical, sanatorium, rehabilitation facilities and home on doctor's advice.

## Apparatus for preparation of singlet-oxygen foams MIT-C

Apparatus «MIT-C» (foams) designed for preparation of singlet-oxygen mixture, based on the activation of distilled water vapors by hard ultraviolet radiation. The resulting mixture can be used for preparation of singlet-oxygen cocktails or singlet-oxygen foam. The use of singlet-oxygen foam is suitable for the prevention and treatment of various diseases associated with the violation of redox processes in the body and impaired aerobic metabolism. The presence in the body of singlet-oxygen mixture increases the amount of free radicals and the activation of biochemical processes in the body.

An oxygen molecule in an excited (singlet) state is for short enough time. This is due to the fact that electron clouds are in an unstable state. Moving electrons on a stable orbit (the state) is accompanied by the emission of photons of electromagnetic energy ultraviolet wavelengths, which in turn provides:



- activation of biochemical and of biophysical processes (exchange-oxidation reactions) in the body;
- bactericidal effect of the secondary UV radiation;
- information influence (ultraviolet radiation is involved in the transfer of information within and intercellular);
- structuring of water and other fluids in the

process of preparation of singlet-oxygen cocktails or foams.

Singlet oxygen cocktails or foam is desirable to use within 10 minutes of their preparation.

The device is recommended for the treatment, prevention and rehabilitation of the following diseases:

- broncho-pulmonary system (asthma, bronchitis);
- cardiovascular system (rheumatism, hypertension, coronary artery disease, heart failure and circulatory failure, and others.);
- neurological disease (pathology of brain vessels, a diencephalic syndrome, vascular dystonia, neurosis, asthenic conditions);
- diabetes;
- systemic diseases connective tissue disease (rheumatism and others.);
- immune diseases.

## Apparatus for electrotherapy dual channel MIT-EL2

The device is intended for use in medical rehabilitation centers, health resorts, therapeutic and preventive and pre-school institutions.

Apparatus for electrotherapy «MIT-EL2» is used to perform electrophoresis or other variants of electro pulse or constant electric current.

Medicinal electrophoresis - a method of combined simultaneous effect on the patient by electric current and certain drugs delivered through in the tissue with the help of current. For electrophoresis are used medications that in an electric field do not lose their pharmacological properties, breaking into ions or absorbing ions themselves. Due to the fact that the medication is in the ionized form, and the reactivity of the organism under the influence of an electric current is increased, even such small amounts of medication have the desired impact. In addition, deposition medication in ionized form of the active form of the skin can significantly prolong its effect.

The use of pulsed operation impact on the therapeutic frequencies provides further:



- removing spastic skin reactions to external stimuli in the form of an electric current medication;
- perform simultaneously with electrophoresis the electric-frequency therapy by currents of Voll;
- enhance the action of medications due to specific, resonant action of an electric current.

Application of the device is most effective in the treatment of:

- lesions of the peripheral nervous system (intercostal neuralgia, sciatica);
- traumatic injuries;
- functional disorders of the central nervous system;
- diseases of the cardiovascular system;
- diseases of the digestive system;
- diseases of musculoskeletal system;
- rheumatic joints and tendons;
- and other skin diseases.

## Apparatus for myostimulation AEST-01

Apparatus for electrical stimulation of muscles «AEST-01» is intended for the treatment of diseases, the pathogenesis of which is the formation of stagnant foci of excitation or inhibition in the cerebral cortex.

The device is intended for recovery or prevention of functions of the neuromuscular system, the impact is carried out by pulse currents. Under the influence of a pulsed electric current the forced contraction of the muscles is obtained.

Indications:

- myopathic paresis and paralysis;
- primary muscular atrophy, which is the result of damage to peripheral motor neuron;
- secondary muscle atrophy as a result of prolonged immobilization after fracture; plastic surgery;



- sexual neuroses;
- marked soft tissue swelling;
- fatigue, atonic and spastic colitis, pancreatitis, adhesive disease;
- atony of smooth muscles of internal organs (stomach, intestines);
- alimentary-constitutional obesity;
- metabolic disease;
- injury, trauma and the effects of aesthetic surgery;
- cellulite;
- figure correction.

Contraindications:

- current intolerance;
- bleeding tendency;
- acute purulent processes.

The device is recommended for use in the treatment and rehabilitation of medical institutions, insurance centers and sports medicine, cosmetology centers.



## Apparatus for electromyostimulation AEST-01 (8-channel version)



Apparatus for electromyostimulation (eight-channel) «AEST-01» is intended for recovery or prevention of functions of the neuromuscular system, where applicable factor is the pulse currents.

Under the influence of a pulsed electric current the forced contraction of the muscles occur, which leads to fat burning and actively

removes it from the body, which reduces the volume of the body and improve the overall muscle tone.

Indications:

- marked soft tissue swelling;
- cellulite;
- alimentary and constitutive obesity;
- dermatological and plastic surgery;
- metabolic diseases;
- damage, trauma and the effects of aesthetic surgery;
- decreased muscle tone;
- fatigue, atonic and spastic colitis, pancreatitis, adhesive disease, myopathic paresis and paralysis;
- body shaping and facial contours;
- atony of smooth muscles of internal organs (stomach, intestines).

Main results achieved:

- improvement of trophic processes;
- recovery of muscle tone;
- strengthening the lymphatic drainage;
- modeling the silhouette.

## The vortex foot bath «KUPAVA»



The basis of the action of whirlpool bath is a combination of different strength of thermal, mechanical, optical and magnetic stimuli. When using the mineral water they are joined by chemical irritation due to the complex range of different mineral salts, gases and microelements.

Additionally is performed «Jet massage.» In this case the air is mixed with the water that circulate under the influence of the electric pump, and thus achieved a special vortex effect, known as the «Venturi tube». The jets of water and air coming from the nozzles located at the sides of the bath, intensively influencing on thy extremities.

Common effects after using vortex foot bath:

- reduction of physical fatigue, exhaustion, increase working capacity and efficiency;
- improvement of the central and autonomic nervous system;
- improve metabolism;

The main indications: neuroses; insomnia, chronic fatigue syndrome; obesity; osteoarthritis of the joints; post-traumatic disorders of the musculoskeletal system (conditions after fractures, sprains and other injuries.); vascular dystonia; pelvic inflammatory disease is acute; impotence, diseases of the cardiovascular system. Women vortex foot massage is a preventive measure against violations of the menstrual cycle.

**Contraindications:** TB and neoplastic bone lesions, acute trauma, fractures, burns.



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OF ULTRASONIC WAVES,  
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IN REHABILITATION**

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