GENERAL INFORMATION Of VIBROACOUSTIC THERAPY

Devices and Natural Methods of Vibroacoustic Effect.

Vibroacoustic effect relates to the microvibration effect within an acoustic frequency range (20-18,000Hz) and amplitude of up to 100 microns (usually up to 20 microns). Such an effect is not damaging and is natural for the organism.

Vibroacoustic therapy is one of the most ancient methods of treatment. Baby cries at birth. The cry itself is not needed for initiation of breathing. It even complicates it. On the other hand, the cry creates a powerful vibroacoustic effect and even significantly enhances the blood circulation towards the brain and lungs, quickly compensating hypoxia which usually occurs in the birth process. The importance of baby's cry is so high that the specialists are seriously discussing the possibility of introducing compulsory vibroacoustic procedures for the newborns with weak cry and other pathological signs of newborns condition.

The following can be regarded as tools of vibroacoustic effect:

1. Voice – extraction of a variety of specific sounds, cry, as well as singing, stimulating sonic frequency microvibration in the head and thorax. There are therapeutic methods based on the use of voice.

2. Massage, including patting, stroking and rubbing.

3. Regular shower and Charcot's douche.

4. Hydromassage in the air jet bathtub.

5. Certain methods of swimming. Diving from the height. Swimming in the waterfall.

6. Massage with a whisk (besom) in hot steam sauna [Russian style sauna]

7. Jogging – a slow run in small frequent steps with low jumps. Every landing creates a complex of modulated vibroacoustic effects on all body bond structures and adjacent tissues.

8. Equipment-produced vibroacoustic effect.

The above list indicates that there are many non-equipment (natural) tools of vibroacoustic effect. They are good for prophylaxis, but due to difficulty in dozing and localization they are of little use for treatment purposes.

From a range vibroacoustic devices the most known are “Intrafon”, Magofon”, “Vitafon”, “Vitafon-IK” and “Vitafon-2”.

There are also devices that are called “vibroacoustic” for advertising purposes, but in fact they are not. The indicator that will help to distinguish them is the absence of any recommendations on norms or dozes of vibroacoustic effect.

Recommendations on vibroacoustic therapy offered in this book have been developed for devices with rationalized and measured microvibration amplitude that also have the feature of scanning frequency alteration within the full sonic range.

Vibroacoustic therapy devices can be used not only for treatment, but also as a preventive measure. Preventive usage helps to increase work efficiency, slow down fatigability, improve general health, decrease occurrence of acute respiratory disease and, if used straight after physical overload, stress and supercoolling, prevent the development of illnesses.

Therapeutic Mechanism of Microvibration Effect

Metabolism processes in the body occur only when biological substances interact. Therefore, mechanical fluctuation of cells and biological molecules is a prerequisite for the majority of biological and especially immunological reactions. For a reaction to occur, direct convergence of interacting components and their spatial orientation in relation to each other is necessary. Erythrocyte must reach the cell to give it its oxygen. Lymphocyte must join the virus in order to neutralize it etc. The speed of all processes depends on how quickly substances move in body vessels, capillaries and tissues (in intercellular space). Mechanical microoscillations, called microvibrations, both increase the contact rate and provide for biocomponents to change orientation in space and also facilitate their penetration through endothelium fissure and various membranes, i.e. enhance transport of blood cells and biological molecules from capillaries to intersticium and back from intersticium into venous and lymphatic capillaries.

The mechanical oscillations are present in the body owing to both the heart pulse activity (infrasonic frequency) and the vascular and muscle activity (sonic frequencies), as well as to mechanical impact of the environment. Because of the hemodynamic barrier, the pulse oscillations are considerably diminished in the tissue space. Quite often, vascular tonus also becomes diminished for a variety of reasons in the area of pathology and then the energy of its own microvibrations in this area may prove insufficient, causing a chronisation of the pathological process and diminishment of the drug therapy efficiency. In these cases an external microvibration turns out to be virtually mandatory.

All natural methods of vibroacoustic effect described earlier have a number of shortcomings – they do not yield well to dosing and localization, their effect is not optimal and they can not always be used in clinical or home conditions.

Vibroacoustic therapy devices with specially selected amplitude-frequency characteristics are more successful and direct in compensating deficiency of mechanical fluctuations. Considering a wide dispersion of molecules, cells, vessels and tissues' mechanical properties, a microvibration effect with a constantly changing frequency and amplitude is preferable because the acoustic frequency range with the infrasound modulation correlates better with the mechanical properties of the tissue elements than other frequencies (patent RF No 2022551).

A no less important property of vibroacoustic therapy involves the ability of the vibroacoustic effect to increase and, in cases of pathology, to restore venous outflow. The mechanism of this effect is simple: under the effect of microvibration on the veins, venules and lymphatic vessels with valves, the blood and lymph fluid move always in one direction (venous pumps are being formed –the kind of micropumps). This effect is particularly evident in muscular contractions. But muscular tissues are poorly represented in many organs, therefore the vibroacoustic effect, which penetrates to the depth of 7-10 cm, activates the venous pumps in all types of tissues and improves the venous and lymphatic outflow. The effect of a nearly double increase in venous pressure during the vibroacoustic therapy has been proved experimentally. Enhancement of venous pump efficiency can be easily observed by any doctor by application of, for example, "Vitafon" device on the area with a considerable posttraumatic edema. After 20-30 minutes of treatment it can be seen by the unaided eye that the size of edema in the

closest to the transformer area has been decreases.

Thus the vibroacoustic therapy facilitates transport of substances in vessels, capillaries and tissues; increases the contact rate of cells and biological molecules, thus providing an improvement of the cellular habitation milieu and outflow of different biological substances (for example, transmitters) in the circulation from the tissue. These peculiarities of vibroacoustic effect helped to develop a method of enrichment of the blood with stem erythropoietic cells (patent RF No 2166924), method of multiple increase of blood interferon in patients with chronic hepatitis and many others, as well as determine the principles of antiinflammatory and proinflammatory therapy.

Summarizing the developed methods of treatment, the main principle can be formulated to determine the aims of vibroacoustic therapy: vibroacoustic effect accelerates processes directed at achieving homeostasis. The intensity of this effect is more evident with the increasing and prolonged deviation from homeostasis. Moreover, vibroacoustic effect does not change direction of the processes. Homeostasis is maintained by frequent change in process direction close to equilibrium position, therefore after vibroacoustic effect there is no evidence of any considerable effects in healthy tissues.

A plate with a hole on top of a curved steel rod bends towards the lower part of the arc under the gravitation. One end of the rod is rigidly connected to the stand and the other end on the second stand is pressed to the vibraphone - the transformer of the vibroacoustic device “Vitafon”. Displaced from its equilibrium position when there are no microvibrations, the plate will be returning to its original position from a few hours to a few days and, if the natural microvibration noise is too small, it won’t return at all. If “Vitafone” is on, the microvibration will be transmitted to the rod and the plate will successfully reach the original equilibrium position within a few minutes. Moreover, when deflected to the other side, it will also return to the zero position. The plate will always be returning to the equilibrium position because microvibration does not set orientation, but only facilitates the movement in the direction set by the system. In our case the direction is set by the gravitation, whereas in the living body the process direction is set by the organism structure (for example, blood system structure) and peculiarities of homeostasis processes. However, in the equilibrium position (homeostasis) the long-term microvibration effect does not cause any system changes.

The vibroacoustic therapy is more efficient the more obvious the disorders in

vascular regulation in the pathology area. This quality, as well as the absence of interference into the fine biochemical mechanisms of regulation, predetermine the high safety, efficiency and a wide range of applications for the vibroacoustic therapy.

The vibroacoustic therapy combines well with a traditional treatment prescribed by a physician, thus considerably improving its results.

The Main Principles of Measurement and Localization of Vibroacoustic Effect

Terminology:

1. VAE - Vibroacoustic Effect
2. Lymphocytes-scouts – specialised types of lymphocytes capable of detecting foreign and damaged cells in tissues and producing specific mediators at the same time.
3. Lymphocytes-killers – specialised types of lymphocytes capable of swallowing and “killing” foreign and damaged cells.
4. Intersticium – intercellular space.
5. Damaged cells – all unhealthy cells, damaged by both external factors and internal causes, in particular apoptosis cells.

In order to explain the principles of measurement of the vibrouacoustic effect more clearly, we will adduce some aspects of tissue homeostasis maintenance.

The process begins with lymphocytes-scouts coming out of arterial capillaries through endothelial fissure in intersticium. If lymphocytes-scouts find foreign or damaged cells, they eject the appropriate mediators, which then get absorbed into venous and lymphatic capillaries. The concentration of mediators in blood and lymph nodes presents the information on the examined zone condition. When concentration of mediators reaches its threshold it triggers a complex of system reactions: capillary pressure increases and thus the number of lymphocytes entering intersticium from the capillary channel grows; big lymphocytes-killers start penetrating the tissue space and transform into macrophages, which detect damaged and foreign cells and “kill” them. The products of this process are withdrawn into lymph nodes through lymphatic capillaries where they finally get neutralized. If there are no pathological cells in the tissue, then lymphocytes-killers do not produce mediators and therefore

the inflammation process does not begin. If there are many damaged cells in the tissue, then many mediators will be produced and the inflammation process will begin.

This is a very approximate scheme, however, it can be used to demonstrate the mechanism of the vibroacoustic effect and its dose-dependent result.

Application Dosing

The application dose in vibroacoustic therapy means amplitude-frequency characteristics of microoscillation and the time of application.

Amplitude-frequency characteristics of the vibroacoustic effect influence the character of the developing inflammation process in the lesion focus, which intensity depends on the quantity of mediators coming into the blood from the tissue. By changing amplitude and duration of the vibroacoustic effect one can regulate the amount of inflammation mediators entering the circulation from the tissue and thus influence the character of the developing inflammation process.

In this regard, there are two tactics of treatment. The first one is antiinflammatory with gradual increase of microvibration amplitude and the period of treatment. The second one is pro-inflammatory with a quick dosage increase from the minimal to the maximum within 1-3 procedures.

The first approach is used for acute inflammations and preventive measures. It helps to gradually remove mediators from the pathology area without hypertrophying the inflammation reaction and thus, gradually “cleaning” the pathology area from the damaged cells. However, when it is necessary to activate system reactions, for example in chronic inflammation processes, the second approach should be used. The provocation of inflammation can be done either within a short single course of treatment followed by a transition to anti-inflammatory therapy, or periodically, once every 3-7 days, using short action microvibration amplitude as an anti-inflammatory therapy in between. This particular anti-inflammatory approach helped to reach good results in patients with chronic hepatitis.

If tissues have few or no damaged cells, then even pro-inflammatory procedures cannot trigger the inflammation reaction (the state of homeostatic equilibrium after vibroacoustic effect does not change). Therefore, reaction of

the organism to a single intensive vibroacoustic effect can serve a diagnostic function.

Since the condition of the pathology area and mass and size of the patients can vary significantly, it becomes necessary to change the maximum active dose. “Vitafon – 2” provides for automatic correction of microvibration amplitude if the weight and height of the patient was set. In “Vitafon” and Vitafon –IK” the dose is set for the average weight of 60-70 kg. Therefore, if full-bodied patients cannot get the desired effect, the maximum time and amplitude has to be increased by 30-50%. And vice a versa, if even a gradual dose increase causes an unexpected exacerbation, it is necessary to decrease the minimal dose and start increasing it very slowly. In practice, when the time of vibroacoustic application on a certain area was increased by 1 minute a day, beginning with 2-3 minutes, it has never caused any exacerbations, but considerably extended the course of treatment. For this reason, the majority of anti-inflammatory treatment schedules include a moderately accelerated dose increase, which in many cases does not cause exacerbation, but if it still happens, then the treatment schedule will be corrected towards the reduction in the dose increase rate.

Areas of Application

Everything mentioned above is true for application on the areas of pathology. However, apart from local application it can be used on kidney area to improve its function and on spinal column area, as well as innervating organs and body parts.

Vibroacoustic effect on kidney area increases their productivity in maintaining acid-base equilibrium and electrolytic blood composition, which in its turn, enhances the outflow of unbalancing metabolism products from tissues and therefore increases vein and lymphatic vessels tonus, significantly improving regional blood circulation. Since all pathological processes are accompanied by an increased supply of metabolism products into the blood, practically all methods prescribe the application on kidney area. The procedures are necessary to stop system limitation of the regional blood flow or to restore it if the limitation has already occurred. Often the effect from vibroacoustic application on kidney area is significantly higher than from the application on the pathology area only. For that reason, in complicated cases of multiple pathologies the vibroacoustic effect on kidney area is the only prescription in terms of vibroacoustic therapy.

If there are no pathological deviations in kidney area, then the nominal doses of application can be reached within a few procedures, but if there is a pathology in kidney area, gradual dose increase should be used.

Quite often patients suffer chronic pyelonephritis, cysts and renal calculi. Patients with chronic pyelonephritis are recommended to take a treatment course first. If there is a cyst on one of the kidneys, it is recommended that the procedure is first carried out on the kidney without a cyst. It is not recommended to carry out procedures on a kidney with a cyst, though it is very likely that this restriction will be removed in the nearest future. Preliminary research studying vibroacoustic effect on kidneys showed that the fortnightly procedure has not only caused no increase in cyst size, but they even started to slightly reduce in size in the next six months of monitoring. Currently this data is being rechecked on a bigger number of patients.

The procedure on kidney area is indicated for patients with renus calculi of up to 4 mm in size because calculi of this size can easily come out through the ureter. Besides, the vibroacoustic procedure assists their quick removal. If calculi are bigger than 4 mm, then the vibroacoustic effect should be used only on the kidney without big calculi, or the treatment can be done after lithotripsy or some other means of removal.

The vibroacoustic effect on the spinal cord is used to improve the innervation of the organs and body parts. Often the respective area of the spinal cord has some inflammatory process going on or an edema. In this case it is necessary to gradually increase the dose. If after vibroacoustic therapy pain in the spinal area increases, the time of the initial procedure should be shortened and the dynamics of dose increase should be slowed down. If there is a disc herniation in the area of application, then it is necessary to undergo treatment first in order to reduce edema, stabilize and restore the muscular corset.

The vibroacoustic therapy on the spinal cord area is as essential as a therapy on the kidney area because it is the abnormality in the nerve fiber conduction due to inadequate blood supply that may be the cause of the illness. For example, weakening of ureter and biliary motility can cause calculi formation and growth. Unfortunately it is very difficult to diagnose a slight inadequacy of blood supply in the spinal cord area. Therefore, vibroacoustic therapy can be prescribed regardless of whether there are evident symptoms of pathology.

Terms of Treatment

How soon can one expect an apparent treatment result after vibroacoustic therapy? It depends on heaviness of the sickness: intensity of pathological changes, the amount of accumulated irreversible changes and illness duration. The higher the degree of illness the longer the treatment should be. Longstanding monitoring of patients using vibroacoustic devices allows to draw the following conclusions:

1. The treatment effect is accumulated, procedure after procedure.

2. A multi-course treatment for a year or longer also facilitates gradual accumulation of the treatment effect.

3. For chronic long-term illnesses, such as arthritis, arthrosis, adenoma and hypertension, the apparent treatment effect can be reached not earlier than in 1-3 months; sometimes the effect is delayed to 6-9 months. As a rule, it is in the patients who were ill for 20-30 years and did not have much improvement after the other methods of treatment.

4. Improvements of the general health condition are noticed within the first weeks of treatment.

5. Removal of edema and inflammation eases joints pain in patients with deforming arthrosis. In spite of the fact that the deformation can still be seen on an X-ray after the treatment, absence of pain allows the organism to adapt to the irreversible changes within 6-9 months. As a result, discomfort and claudication disappear.

6. Termination of vibroacoustic therapy causes gradual loss of the treatment effect. Therefore, it is necessary to repeat treatment.

7. As a whole, it became apparent that the treatment effect depends on the length of procedures and the total period of treatment, which leads to the tendency in the newly developed methods of treatment to increase the maximum time of procedures as well as days of treatment, and reduce intervals.

Microvibration is and important life resource.

Microvibrations are present in every living organism. They are produced by the contractions of the muscles' cells and fibers, which form more than a half of a body's mass. Muscle cells from time to time contract even in the passive state or during sleeping; this provides the satiatation of tissues by microvibration.

Keeping of normal microvibration factor causes considerable spending of muscles' recourses. Notwithstanding the fact that the background muscle activity may look insufficient, in one day a human organism spends for the keeping of microvibration background approximately the same energy as during 2-3 hours of intensive physical work. This shows the microvibration is an important and indispensable resource of any living organism. Why are they so necessary for an organism?

The first process, for which organisms use microvibrations, is the provision of venous blood flow. A heart, due its capacity, is not able to provide the recurrent flow of blood from the bodily tissues. Such recurrent flow is provided by the valves on the venous vessels; these valves let the blood flow in one direction only – from bodily tissues to the heart. Control over the activity of these valves takes place due to the changing microvibration tone of the veins. It forms the so-called "inner micro-pump", which is able even to overcome the gravitation.

The second function of the microvibrations is supplement of cells with the nutrition and utilization of the cells' products. Pericellular space, the so-called "intersticium", is filled with intercellular liquid. The cells receive their nutrition from this liquid and discharge products of their activity, the slags, also in it. The slags are removed from the intersticium to the lymphatic net. Transportation of slags within the lymphatic vessels is performed with the means of microvibrations only. Microvibrations are present there due to the activity of the clack-valves, present in the lymphatic vessels.

In an inflammation zone the speed of slag forming can be faster than the utilization capacity of the lymphatic system. Enlargement of slags in the intersticium causes that the concentration of nutrition substances, which come to the intersticium from capillaries, becomes lower. Insufficient nutrition of cells makes the situation with the lack of resources, necessary for production of microvibrations in the inflammation zone, even worse. The circle is closed. Nowadays more and more scientists suspect that the main reason of the chronization of diseases is the lack of the resource of microvibrations.

The third important role of microvibrations in a living organism is connected with the activity of complicated immune mechanisms. Immune reactions take place when

special cells go through pericellular space. These cells are looking for damaged and strange cells. The possibility that such damaged cells will be found becomes higher if the tissue is satiatated by microvibrations; it depends on the distance of their route and the frequency of contacts. This is the most obvious example, which shows the importance of the microvibration resource. A number of investigations and experiments, proving the increase of the immune reactions in the organism under the influence of microvibrations were made.

The level of microvibrations, produced due to the muscles' tone can be easily registered by the wideband (1Hz-1kHz) electronic phonendoscope of the special device - myotremorograph. In physical activity, the level of microvibrations is 3-10 times higher than in rest. On the other hand, during sleeping muscle tone becomes lower and, subsequently, the level of microvibrations also decreases – approximately in two times if to compare with the state of rest. This provides an organism with the opportunity to restore its' muscle recourses but, at the same time, causes hydropic state of tissues in the morning. Microvibration background in the inflammation zone can be 3 or even more times higher than in the rest tissues – this proves that this zone needs enlarged lymph out-flow there.

Systematic physical exercises for keeping of muscles' tone and even ordinary physical activity provides the organism with the necessary volume of microvibrations. However, with the age or when the physical activity is not enough (seating life-style and, of course, lying patients) the satiatation of tissues with their own microvibrations becomes much smaller.

Even a healthy man feels the lack of microvibrations in his inner organs, which do not have their own muscle fibers – kidneys, liver, spleen, marrow and spinal cord. Old people in general have lowered microvibration background and, subsequently, lowered nutrition of cells, decrease in the functions of inner organs and, as a result, their microvibration background become even lower. It is one of the main reasons of "wasting away" of a living organism.

The logical way out from these "problem circle" is helping the organism by microvibrations from an outer source. Taking into consideration the fact that the efficiency of lymphatic micro-pumps is proportional to the frequency of microvibration, we can conclude that the use of a high frequency will be the most effective. For the safety reasons, it is better to use microvibration of sound frequency, within the frames of the microvibrations produced by a human voice. Some scholars say, with the number of indirect proofs, that little babies cry to satiatate their brains with the effective microvibrations of the sound frequency.

Application of microvibrations for the treatment and prevention of diseases is called “vibroacoustic treatment” and “vibroacoustic resource support of the organism”.