

INFLUENCE OF ULTRASOUND ON THE HUMAN BODY

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Introduction. Ultrasound refers to mechanical vibrations propagating in elastic media and solids. The source of ultrasound in production is equipment in which ultrasonic vibrations are generated for performing technological processes, technical control and measurement, as well as installations, during the operation of which ultrasound occurs as a concomitant factor.

Along with other physiotherapeutic procedures, ultrasound treatment: enhances metabolic processes in tissues increases the production of collagen and elastin; saturates cells with oxygen; normalizes blood circulation; relieves pain and spasms.

A unique property of ultrasound is the formation of cavitation (microbubbles), which ensures its physicochemical effect. Ultrasound has mainly a local effect on the body, since it is transmitted by direct contact with an ultrasonic instrument, processed parts or media, where ultrasonic vibrations are excited.

Aim. To determine the effect of ultrasound; highlight its positive and negative effects on organs; elucidate the specifics of sound waves; prove the importance of ultrasound in the diagnosis and treatment of various diseases.

Materials and methods. The work was carried out at the Department of Educational and Information Technologies, as well as at pharmaceutical enterprises to determine the role of ultrasound in pharmacy. We used data from archival materials about the importance of ultrasonic radiation for medicine and the human body as a whole. During the study, a conversation was held with physiotherapists about ultrasound therapy, and the role in the treatment of Covid-19 was determined.

Results and discussion. The method of administration with the help of ultrasound of drugs (phonophoresis) is becoming widespread. With phonophoresis, as a rule, a labile (massage method) method of exposure is used. All parameters of ultrasound exposure are set by the doctor, and the procedure is performed in accordance with them.

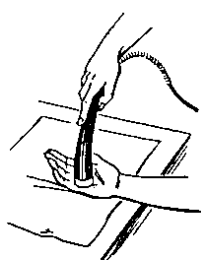
Therapeutic techniques:

- Effect on the joints and paravertebral zones of the spine

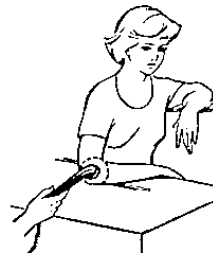
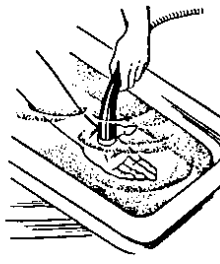
Ultrasound for joint diseases is prescribed locally on the area of the affected joints and on the reflexogenic zones of the cervicothoracic and lumbosacral spine.

- Elbow area and hand

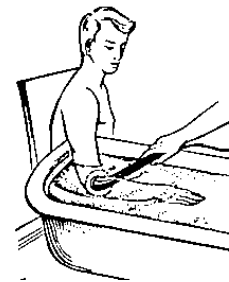
Apply an impact around the joint with an intensity of $0.2-0.6 \text{ W /cm}^2$, a continuous mode, a labile technique, a contact method (Pict. 1,2).



Picture 1

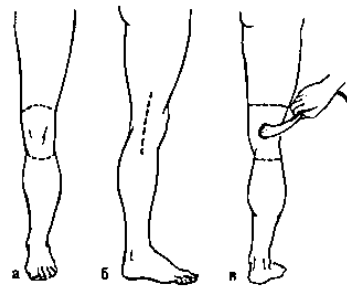


Picture 2



– Knee area

Apply an impact around the joint (excluding the patellar area) with an intensity of $0.4-0.6 \text{ W / cm}^2$, a continuous mode, a labile technique, a contact method (Pict. 3).



Picture 3

– Hip area

Prescribe an effect around the joint with an intensity of $0.6-0.8 \text{ W / cm}^2$, a continuous mode, a labile technique, a contact method. The duration of the procedure is 5-10 minutes, daily or every other day, for a course of 6-10 procedures.

– Ankle area

Influence around the joint with an intensity of $0.4-0.6 \text{ W / cm}^2$, continuous mode, labile technique, contact method or in a bath through water, duration 5–10 minutes, daily or every other day, for a course of 6–10 procedures.

– Influences on the paravertebral zones of the spine

The paravertebral ultrasound procedure is performed while lying on a couch or sitting on a chair. The technique is labile, contact method.

– Exposure to ultrasound on the peripheral nerves of the extremities

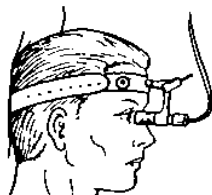
In diseases and injuries of peripheral nerves, ultrasound is applied along the affected nerve trunks and on the reflexogenic, paravertebral zones of the corresponding segments of the spine.

–The impact on the nerves of the leg along the sciatic, femoral or other nerves is applied with an intensity of $0.2-0.6 \text{ W / cm}^2$ in a continuous or pulsed mode, the technique is labile, the method is contact.

– Influence on the nerves of the hand on the area of the brachial plexus, shoulder, forearm, along the ulnar, radial nerves, apply an effect of intensity $0.2-0.4 \text{ W / cm}^2$.

- Effects on the eyes

Two methods are used depending on the localization of the process. The first method (direct, contact) is indicated for diseases of the skin of the eyelids, accessory organs of the eye. The second method (bath) is indicated for the treatment of diseases of the eyeball (Pict. 4).



Picture 4

- In case of lung diseases

In bronchitis and asthma, ultrasound helps to reduce the tone of the bronchi, reduces inflammation, and has a desensitizing effect. In pulmonary tuberculosis, ultrasound is used against the background of continuous antibiotic therapy (Pict. 5).



Picture 5

–Ultrasonic inhalations are based on the breakdown of liquid by means of mechanical vibrations of ultra-high frequency or ultrasound.

Ultrasonic inhalations are indicated for lung abscess, pneumosclerosis, pneumonia, occupational lung diseases, and also as rehabilitation after coronavirus.

- Ultrasound therapy of the lung area (rehabilitation after Covid-19)

The therapy is carried out in 3 zones.

– The first zone – two paravertebral fields of the thoracic spine (right and left). Intensity 0.2 W / cm^2 , continuous or pulsed mode.

– The second zone is the area of 6-7 or 7-8 intercostal spaces, starting from the paravertebral line to the middle axillary. Intensity 0.4 W / cm^2 , continuous or pulsed mode, the technique is labile.

– The third zone is the subclavian region from the sternoclavicular joint to the shoulder joint on the right and left. Intensity 0.2 W / cm^2 , continuous or pulsed mode, labile technique, contact method.

Contraindications: organic lesions of the central nervous system; pronounced dysfunction of the endocrine glands; malignant neoplasms or suspicions of them; blood diseases, a tendency to bleeding; aneurysm of the heart, aorta; tension tenocardia of III and IV functional classes, heart rhythm disturbances; hypertension stage III; circulatory insufficiency of II-III stages; pregnancy.

Ultrasound in pharmacy

The short wavelength of ultrasound makes it possible to obtain information about a substance and, accordingly, to monitor various processes in pharmaceutical technologies. Such specific effects as cavitation, dispersion, emulsification, disinfection, local heating allow to influence the substance.

Dispersion – fine grinding of solid, liquid bodies in any medium, as a result of which powders, suspensions, emulsions are obtained.

Conclusions. In the course of the study, it was revealed that the use of ultrasound has significantly enriched the arsenal of physiotherapeutic methods. Exposure to ultrasound alone on the focus of the disease in acute and chronic aseptic processes affecting joints, tendons, ligaments and other links of the extremities contributes to the rapid restoration of their musculoskeletal function. Ultrasound is also used in the pharmaceutical industry. The main areas of application of ultrasound in pharmaceutical technology are: ultrasonic washing and cleaning; preparation of solutions, emulsions, suspensions; ultrasonic dispersion; ultrasonic sterilization of liquid media. At the heart of every practical application of ultrasound is some specific effect. It is necessary to understand that in addition to the positive effect, ultrasound also has a negative effect. Therefore, the design of ultrasonic equipment for use in the production of drugs should focus on maximizing the beneficial effect and suppressing the rest.

ПОРІВНЯННЯ МОЖЛИВОСТЕЙ РІЗНИХ ПРОГРАМНИХ ЗАСОБІВ ДЛЯ ЗДІЙСНЕННЯ МНОЖИННОГО РЕГРЕСІЙНОГО АНАЛІЗУ В ДОСЛІДЖЕННЯХ ПАРФУМЕРНО-КОСМЕТИЧНИХ ЗАСОБІВ

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Вступ. Регресійний аналіз — розділ математичної статистики, присвячений методам аналізу залежності однієї величини від іншої. На відміну від кореляційного аналізу не з'ясовує чи істотний зв'язок, а займається пошуком моделі цього зв'язку у вигляді рівняння. Регресійний аналіз використовується в