

USE OF MEDIUM FREQUENCY CURRENTS IN REHABILITATION

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Abstract

The article highlights the possibilities of applying medium-frequency currents across a wide range of indications and a relatively small amount of contraindications. It briefly informs about the electrophysiological properties and therapeutic effects of currents beneficial to patients.

Key words: Medium Frequency Currents. Interference currents. Rebox.

1 Introduction

In rehabilitation practice, physical therapy and specific electrotherapy is a very often used means of influencing pain and detaching painful muscles and tendons as a preparation before motion therapy. In electro-treatment, as forms of exploiting the positive effects of different types of electric currents, the application of medium-frequency currents in their various modifications is most frequently used. This is due to the relatively short application time, the effectiveness of treatment in terms of pain reduction and relaxation of muscle tension in a wide range of indications and a minimal amount of contraindications. Medium-frequency currents are most commonly used in the form of interferences current and as Rebox.

2 Medium Frequency Currents

Frequency range of medium-frequency currents is 1000 - 100,000 Hz. In practice, a range of 4000 - 50,000 Hz is used. Medium-frequency currents have favorable electrophysiological properties such as decreasing nerve quiescent potential, which becomes more irritating due to an effect similar to katelectroton [1-3]. An ambipolar effect is very advantageous, which means that the irritation of both poles is the same. Higher intensity of application causes muscle contraction. For muscle irritation, frequencies 2500 - 5000 Hz are appropriate. The sensitivity threshold is higher than the threshold of motor irritation. Subsequently, lower irritation is obtained, which is an advantage for electrostimulation and electrogymnastics. Medium frequency current at 5000 Hz penetrates the skin 100 times lighter than the low-frequency current, and does not apply electrolysis when applied. At the same time no irritant effect on the myocardium is present. At the biochemical level, stimulation of endorphins, dispersion of metabolites of inflammation, stimulation of cAMP formation, which regulates trophic, growth and function of tissues, is stimulated by the application [4].

The principle of interference streams: When applied, the effects of 2 circuits in the tissue are summarized. One circuit has a constant frequency of 5000 Hz, in the second circuit the frequency varies between 5000 - 5100 Hz. At the intersection point there is interference, otherwise expressed low-frequency modulation of the medium-frequency current (Figure 1). The effects are the same as for low-frequency currents. It is preferable to apply them to subacute and more chronic diseases. Application Rebox is also suitable for acute illness. A constant frequency of 100 Hz has a sympatholytic and analgesic effect. The fluctuating frequency of 90 - 100 Hz has a similar effect, but no habit is involved in the application. The fluctuation frequency of 50 - 100 Hz has an analgesic effect due to hyperemia, acid catabolism resorption and detonation. Variable frequency 1 - 10 Hz tones sympathetic, 20 - 40 Hz tones the vagus and 1 - 50 Hz frequency tones and irritates the muscles. Frequency fluctuations of 1 - 100 Hz have a detaching, analgesic and hyperemic effect.

Indications of medium-frequency currents: painful conditions based on myofascial syndrome, painful conditions under degenerative changes of the spine and disorders of the intervertebral disc, painful tendon syndromes, painful syndromes in the affection of the weight-carrying joints under degenerative changes (coxarthrosis, gonarthrosis, omarthrosis), painful states in impingement syndrome, humeroscapular periartthritis [1-3].

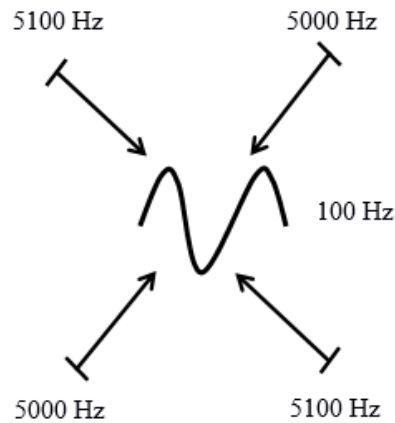


Fig. 1 The principle of interference currents

Contraindications of medium-frequency currents: inflammatory and purulent skin diseases, inflammation of the vein and lymphatic pathways, active TB, hemorrhagic conditions, multiple sclerosis, Morbus Parkinson, pregnant uterus, hyperthyroidism, current pathway stimulus, tumor tissue in the current path, carotid sinus area [1,3,5].

3 AMF - amplitude-modulated medium-frequency currents

They work on a similar principle, there is no interference. The carrier frequency 4000 - 5000 Hz is frequency modulated by the electronic device in the device. 2 electrodes are used, with no penetration depth as with interference streams. They are suitable for electro-gynecology, or long-term stimulation of hypotonic muscles in scoliosis [1-3].

4 Isoplanar vector field

Technically, there is an additional modulation of the two channels at 4 electrodes, thereby achieving scattering throughout the crossover area. No exact perpendicular targeting is required as with classical interference. The effect of the application is deep, diffuse and gentle, and is also suitable for the area of TEP implanted. It can also be used in more acute conditions [3, 5]. Phase and amplitude modulation create a dipole with one direction of action where the modulation is 100% and in the dipole direction is the modulation zero (Fig. 2). We can rotate the dipole manually and accurately target the affected tissue, depending on the patient's response. Automatic rotation mode is also possible.

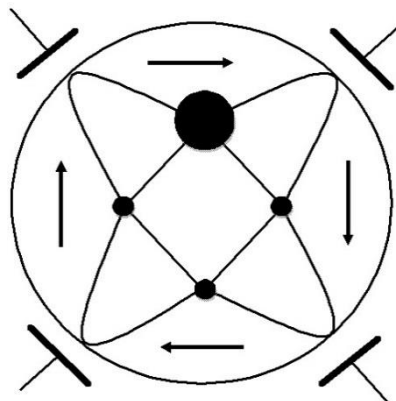


Fig. 2 Isoplanar vector field

5 Kötz's streams

This is the name of medium frequency frequencies of 2500 Hz, which are trapezoidal amplitude modulated (Figure 3). Modulation produces a burst of current (burst, with a small amplitude from the minimum to the climb to a certain value with the consequent decrease), the whole process is repeated at the frequency 50 Hz or 100 Hz. This type of current eutonizes the muscle tension [3, 5].

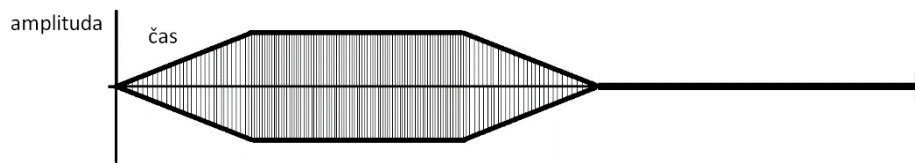


Fig. 3 Kötz's streams

6 Rebox

Rebox is an electrophoretic non-invasive device utilizing mid-frequency rectangular currents (Figure 4). Developed in 1980 by Ing. Petr Slovák, Ph.D. Electric rectangular pulses with a frequency of 2 - 4 kHz are generated in the device, which are transiently transferred to the treated area through a noninvasive tip electrode. The electrode is applied perpendicularly to the skin. The second, cylindrical, electrode holds the patient in his hand. The electrical circuit closes. Rebox provides three treatment modes. The GENTLE mode (4 kHz frequency) is used at the start of therapy. The STANDARD mode (frequency 3 kHz) is used most often. The STRONG mode (frequency 2 kHz) is suitable for patients with reduced sensitivity to electrical impulses [6].



Fig. 4 Rebox

Principle and effect: Rebox's treatment method is based on the principle of transcutaneous correction of local acidosis, which occurs in acute, subacute and chronic conditions. The result is swelling, increased muscle tension and pain. Cathodic stimulation results in local changes in ion concentration in the tissues. Positive ions (Na^+ , K^+ , Ca^{2+}) are attracted to the treatment cathode at the application site. Within seconds, myorelaxation of the tissues occurs. In the cathode space, water molecules are dissociated on H^+ and OH^- , leaving hydrogen ions in the environment and formation of sodium hydroxide and potassium hydroxide. This leads to a reduction in local acidosis and to alkalization of tissues. The result of this process is analgesia. Increased ions lead to increased microcirculation of blood and lymph, and hence an anti-edematous effect. These effects are observable a few minutes after Rebox application and are of a long-term nature [6].

Method of application: The patient grasps the cylindrical electrode in the palm of the hand and the attendant attaches the tip electrode to a subjectively healthy site that should be dry (not covered by a cream). The device is adjusted so that the patient senses the passing current to a tolerable rate while the hand of the device reaches about half to two-thirds of the possible displacement. The point electrode is applied to the skin at 30° angles, then it is permanently lifted up almost to the perpendicular position. In healthy tissue, the hand is deflected in about 3 seconds, with the affected tissue approximately 10 seconds. If even after this time the measuring instrument does not reach the desired deviation, the attendant places the electrode a few millimeters further and the procedure is repeated. In this way, it is possible to find the limits of the affected area and then proceed with the treatment inward. Treatment at one point takes the hand-stop on the measuring instrument, then treats another spot 3 cm from the previous one. The application should be in the correct geometric shape (spiral, circle, line, etc.) depending on the anatomical shape of the muscles. When applying Rebox to a larger area (the entire upper limb), the application point distance can be increased to 5 cm. With one application, it is enough to treat 20 to 30 points. Initially, the procedure is repeated 3 to 5 times a week, after the improvement of the condition, the frequency should be reduced [7].

Indications and contraindications: Due to its effects, Rebox can be used for a wide range of diseases. These may be acute, subacute and chronic pains due to functional disorders, tendon and ligament injuries, and can also

be used to speed up healing of postoperative scars and absorption of swelling. Contraindication for the use of this type of electrotherapy is implanted pacemaker, shock conditions, cancer, pregnancy, phlebotrombosis and inflammatory skin diseases [6].

7 Conclusion

Medium-frequency streams are effectively used in rehabilitation practice and bring considerable benefits to patients and therapists. Their application is simple and application time is adequate. The most important effect of their application is the rapid relief of pain (especially Rebox), detension of stiffened muscles in the preparation before kinesiotherapy. To better objectify the effects of medium-frequency currents, we recommend that each physiotherapy departments to assess the success of treatment through a visual analogue scale.

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