

## Functions of instrument

An electric current is the directional movement of free electric charges. But if in metals (conductors of the first kind) the current is created due to the directional movement of free electrons, then in the tissues of the body, which are conductors of the second kind, electric current is created by the movement of oppositely charged ions in opposite directions: anions to the cathode, cations to the anode. The passage of current through the tissue causes the transfer of various charged substances and changes in their concentration. It should be noted that human skin without damages has high d.c. resistance and low electrical conductivity, so the current penetrates the body mainly through the excretory ducts of the sweat and sebaceous glands and intercellular channels. Since the total pore area does not exceed 1/200 of the skin surface, then most of the current energy is spent on overcoming the epidermis with resistance. It is in the epidermis that the most pronounced primary (physio-chemical) reactions to the action of direct current develop, the irritation of the nerve receptors is more pronounced.

Having overcome the resistance of the epidermis and subcutaneous adipose tissue, the current further spreads through the intercellular spaces, muscles, blood and lymphatic vessels, deviating significantly from the straight line, which can conditionally connect two electrodes. In a much less degree, direct current passes through nerves, tendons, adipose tissue and bones. Electric current practically does not pass through the nails, hair, horny layer of dry skin.

The electrical conductivity of the skin depends on many factors, and above all on the water-electrolyte balance. For example, tissues in a state of hyperemia or edema have a higher electrical conductivity than healthy ones.

The passage of current through the tissues is accompanied by a series of physicochemical shifts, which determine the primary effect of electric current on the body. The most significant is the change in the quantitative and qualitative ratio of ions. Due to the difference of ions (charge, size, degree of hydration, etc.), the speed of their movement in the tissues will be different. Therefore, after galvanization in the tissues of the body, ionic asymmetry occurs, affecting the life of cells.

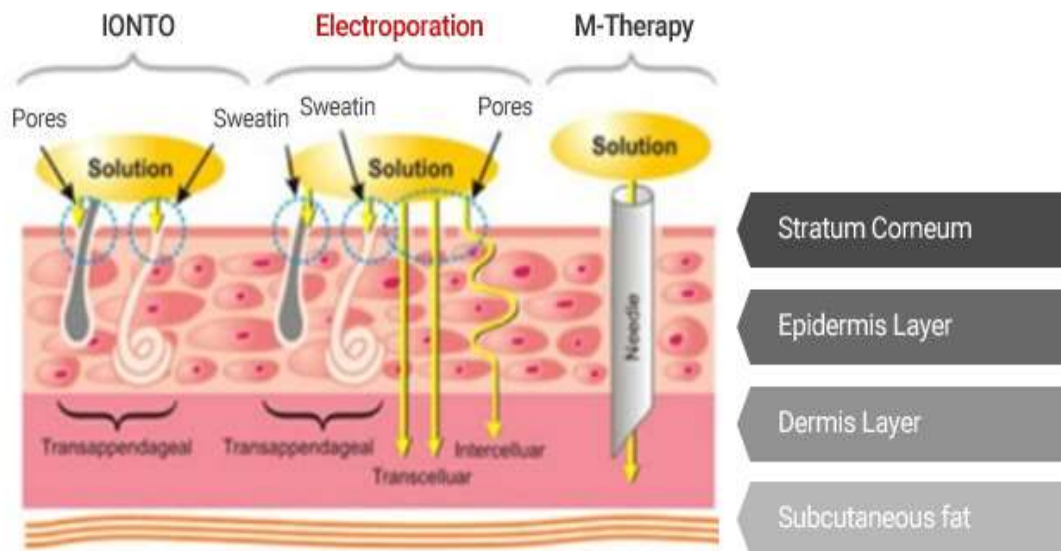
A characteristic manifestation of ionic asymmetry is the relative predominance of monovalent cations ( $K^+$ ,  $Na^+$ ) at the cathode, and divalent cations ( $Ca^{2+}$ ,  $Mg^{2+}$ ) at the anode.

Under the action of electric current, there is an increase in the activity of ions in the tissues, due to the transition of some of the ions from the polyelectrolyte (in particular, protein) to the free state. This contributes to an increase in the physiological activity of tissues and is considered as one of the mechanisms of the stimulating action of electric current.

A significant role among the primary mechanisms of action of direct current is played by the phenomenon of electric polarization - the accumulation

of oppositely charged ions in cell membranes with the formation of an electromotive force having a direction opposite to the applied voltage. Polarization changes the permeability of membranes and affects the processes of diffusion through it of many compounds, including water. Starts a cascade of reactions characteristic of reversible cell damage.

The main operation principle is based on electroporation and electro osmosis (i.e needle-free mesotherapy of the dermis).



## 2.1 Needle-free mesotherapy functions

**Electroporation:** it acts directly on the skin, rapidly increasing the permeability of the skin. Under the influence of shock effect infiltrates formed in the lipid cell mobilizer and at the same time, hydrophilic molecules that were not originally absorbed can penetrate into the internal structure of the cell. After formation infiltrates within several seconds to several minutes, they are opened.

Due to electroporation, more precisely to currents of a certain power and frequency, in the upper dermal layer - the epidermis - ion channels are opened, which are located next to the aqua canals. Protein-carriers of these channels are connected with molecules of a particular substance and transfer them to the inner skin layers. After the termination of the electric field, the ion channels are closed, and the necessary substance remains inside the skin.

The principle of electro osmosis is to activate the molecules of a substance that can supply a positive current to positively charged molecules.

The needle-free mesotherapy (without injections) has a number of benefits:

- no damage to the skin;
- painless treatment without injections;
- instant effect;
- short rehabilitation period;
- no redness on the skin;

- versatility: it can even be used by women with fragile vessels or sensitive skin.

During electroporation, the substances are intaken into the skin to a depth of 1.5 cm. In the treatment area after the treatment, a “storage site” is formed, from which medical preparations are released into the cells gradually. The period of removal of various substances from the skin "storage site" is from 3 to 15-20 hours.

The following parameters affect the amount of solution intake and its depth of penetration:

- 1) Amperage.
- 2) The concentration of the medical preparation.
- 3) Treatment time
- 4) Physiological condition of the skin.

## 2.2 Treatment recommendations

The labile electrodes technique is used.

Features of the use of labile electrodes are as follows:

- a large area of coverage
- the whole face and neck is treated in one session;
- precise dosage of current for different parts of the face;
- visual control of the vascular reaction during the treatment;
- simplicity and ease of use.

Prior to treatment, consultant should offer comprehensive consultation for specific conditions of customers., be sure to familiarize the client with the procedure, specify the presence of any contraindications, give advice on skin care before and after the procedure.

- Before the treatment, clean the skin from sebum, dirt and make-up.
- Apply a special skin care product on the skin surface.
- Check all accessories before starting the procedure: their availability, serviceability, cleanliness.
- Press POWER button.
- Press START/STOP button.
- Set the intensity level by pressing INTENSITY up-down buttons;
- Set time level by pressing TIMER up-down buttons.
- Press START/STOP button to start the treatment.
- The passive (contact) electrode the patient should take in the hand. Remove all jewelry from this hand. The operator works in a circular or linear motions, moving the treatment handpiece along the surface of the skin. The treatment should be started with a low intensity, increasing it during the procedure if necessary, focusing on the client's sensations and skin reaction. Be sure that the area under the working handpiece was well hydrated.
- Press START/STOP button to stop the treatment. Press POWER button to switch the machine off.
- Remove gel from the skin after finishing the treatment.
- Apply skin care product or mask according to the skin type if necessary.

Depending on the indication, the following treatment courses may be recommended:

- **intensive:** consists of 3 to 10 treatments, one treatment in 5 days interval;
- **maintain:** one treatment per month to maintain the result of intensive course.

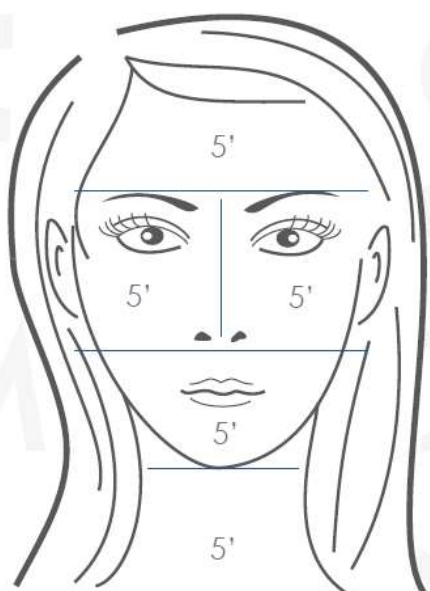


Рис.1. Recommended time

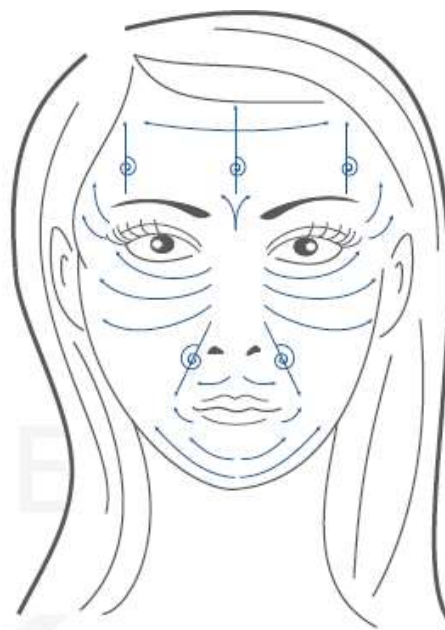


Рис.2. Recommended motions

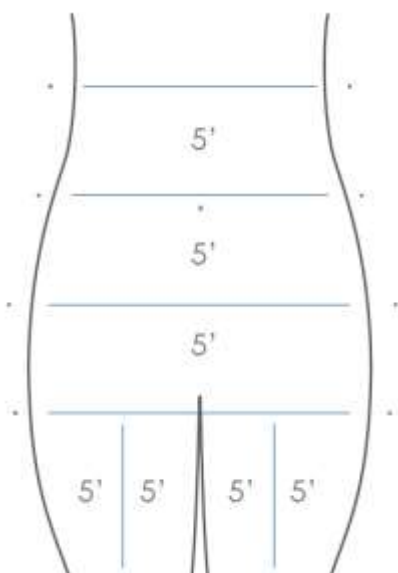


Рис.3. Recommended time

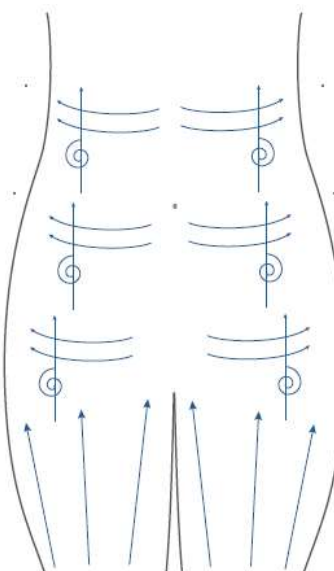


Рис.4. Recommended motions

### **Dosing of current intensity**

Inform the patient about the sensations during the treatment. Usually, it is like pain free tingling sensations. The strength of the current during the treatment should be set precisely by psychological sensations, ensuring their clarity and comfort. The sensitivity of the skin to the current is different in different areas. The neck, nose and eyelids are usually more sensitive than the cheeks and forehead. The threshold of sensitivity is individual and may vary throughout the day. If the sensations become painful, you should smoothly reduce the strength of the current.

During the electroporation treatment, it is important to take into account the electrical conductivity of tissues. It depends on the concentration of ions and the intensity of the exchange of liquids. The stratum corneum of the skin is the main barrier to current, so the conductivity of the skin depends largely on its condition.

The above information is applied practically as follows:

- it is necessary to clean the skin from oil before the treatment;
- skin areas with micro trauma may be more sensitive to current;
- penetration of hairs under the labile electrode, as well as the places where nerves exit, can give unpleasant sensations;
- current intensity may vary on different parts of the skin of the face (and body).

### **Treatment benefits**

1. Elimination of freckles and skin whitening. Open channels, promoting active metabolic process in the cells resulting in their rejuvenation.
2. Wrinkles reduction.
3. Acne treatment.

### **2.3 Indications**

1. Improvement of skin health:
  - oily skin, enlarged pores, subcutaneous induration and infiltrates;
  - skin texture improvement, fatigue syndrome, skin oxygenation;
  - aging skin, dehydrated skin, wrinkles, dryness of skin surface.
2. Skin around the eyes:
  - eye bags, wrinkles, puffiness,
  - detoxication, reducing capillaries visibility

### **2.4 Contraindications**

General, absolute:

- Malignant neoplasms;
- Diseases of the cardiovascular system in the stage of decompensation (acute inflammatory processes in the myocardium, endocardium, pericardium, heart

defects, myocardial infarction in the acute period, frequent angina, acute cardiovascular failure);

- Hypertension stage III;
- Pronounced sclerosis of cerebral vessels;
- Systemic blood diseases;
- Hemorrhage or hemorrhagic tendency
- Cachexia;
- The overall serious condition of the patient;
- Fever (temperature above 38 ° C);
- Mental diseases (epilepsy, hysteria, psychosis);
- Varicose veins stage III;
- Active symptoms of phlebitis;
- Severe vascular sclerosis with a tendency to thrombosis and hemorrhage;
- kidney failure, liver dysfunction and thyroid function abnormality;
- The active form of tuberculosis of the lungs and nephrotuberculosis;
- Severe hypotension.

General:

- the presence of a pacemaker;
- individual intolerance of current;
- individual intolerance to the drug substance;
- pregnancy;
- high blood pressure;
- generalized eczema;
- active thrombophlebitis.

Local:

- the sensitivity of the teeth;
- dental cysts;
- diseases of the thyroid gland;
- Sinusitis, frontitis in the acute stage;
- gold and platinum threads;
- severe skin irritation after the treatment;
- the presence of metal in the area of the procedure (large pins, plates, prostheses, etc.);
- acute intraarticular injuries;
- an acute form of herpes infection;
- chronic dermatosis in the acute stage (neurodermatitis, psoriasis, etc.);
- kidney stone disease and cholelithiasis (when the treatment area is abdomen or lower back);
- skin wounds;
- acute purulent inflammatory processes.