

BIOPHYSICAL BASIS OF THE TECHNIQUE OF SELECTIVE PHOTOTHERMOLYSIS

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Introduction. The method of selective photothermolysis-complex non-ablative procedures carried out on devices intense pulsed light directed at correcting manifestations chrono-and photoaging, as well as in the treatment of a variety of pigmented and vascular lesions in patients of any vozrazrasta.

Aim. To make the analysis methods of laser rejuvenation features, advantages and disadvantages in the practical application of each technique as well as prospects for the development of these technologies.

Materials and methods. The principle of selective photothermolysis has been formulated in the form of guidelines:

1. The absorption of electromagnetic waves to be selective, ie certain tissue structures (targets) to be subject to change;

2. The radiation source must generate electromagnetic radiation of a certain wavelength;

3. The energy of radiation and exposure time should cause an increase in the specified target temperature to the required value;

4. The impact of radiation on the surrounding tissue should be minimized. Absorption of the light passing through the fabric, independent of its original intensity I_0 of the radiation, the substance layer thickness l , through which the light of the wavelength λ of light absorbed and the absorption coefficient α according to the law of Bouguer-Lambert-Beer.

If the light is not absorbed, it is no effect on the tissue does not occur. When absorbed all the energy of the photon is transferred to a molecule or part thereof (chromophore). At the same molecule in an excited state. The most important endogenous chromophores biological tissues are melanin, hemoglobin, oxyhemoglobin, water and collagen. The choice of chromophore defined set of clinical task. chromophore absorption coefficient depends on the wavelength: $\alpha = f(\lambda)$. Therefore selective absorption of radiation must be of a certain wavelength corresponding to the peak of the absorption spectrum of the chromophore. The constant α determines the radiation penetration depth d - is the thickness of the layer, the passage of which light intensity decreases by a factor e . The molecule to absorb the energy of the radiation, can not long to arrive in the excited state. Going back to

the ground state, it gives energy to the radiative (fluorescence effect) or nonradiative transition. When nonradiative transition energy of the absorbed photon is released as heat, which leads to an increase in temperature. With the passage of the beam in biological tissue is shown the effect of scattering - light deviation from its original direction. The importance of the phenomenon of dispersion is that it quickly reduces energy flux available for absorption chromophore therefore reduces the clinical impact of radiation on tissue. According to the Rayleigh scattering intensity is inversely proportional to the fourth power of the wavelength: $I \sim \frac{1}{\lambda^4}$. Therefore, an increase in wavelength contributes to the delivery of energy to the deeper lying structures. The process of the scattering of the radiation in the skin due mainly to the dermis collagen. Features: This technique allows during one procedure to effectively eliminate several problems (including professional and personal tattoos).

It can be recommended for all skin types, regardless of age and gender.

Disadvantages

1. Infection (10.8%);
2. Persistent erythema associated with hyperactivation healing mechanisms and increased vascular proliferation;
3. Chronic hyper- and hypopigmentation (violation of melanocytes exchange);
4. There is a risk of scarring (scar formation)

Results and discussion. The method of selective photothermolysis has its advantages as well as disadvantages. The term refers to the phenomenon of photothermolysis tissue destruction under the influence of heat generated by the absorption of electromagnetic radiation in the optical range.

Conclusions. This method is very effective and urgent in medicine and in hardware cosmetology, as well a perspective.