

**HEALTH MINISTRY OF RUSSIAN FEDERATION**

**MOSCOW MEDICAL ACADEMY after I.M.SETCHENOV**

**INSTITUTE OF PLASTIC SURGERY AND COSMETOLOGY**

**THE USE OF OZONE-OXYGEN GAS MIXTURE  
IN DERMATOLOGY AND COSMETOLOGY**

*METHODICAL RECOMMENDATIONS No. 2003/84*

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**Methodical Recommendations developed by:**

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## **P R E C I S**

The Methodical Recommendations are covering the modes of ozone-oxygen therapy for treatment of skin diseases, correction of cosmetic defects as well as for use as an adjuvant anti-inflammatory and wound-healing medicine in the postoperative period. The essence of this method is that medical ozone is introduced by parenteral and local route and can be used as a monotherapy or a component of complex treatment. The recommended modes of systemic and local ozone therapy allow differentially using it for therapeutic and preventive purposes depending on the course and duration of disease, activity of inflammatory process and associated pathologies. The use of this method is supported by available certified equipment. The Methodical Recommendations are intended for physicians – medical practitioners in the field of dermatology, cosmetology and physiotherapy.

## **1. Introduction**

Even the most modern pharmaceuticals used for treatment of skin diseases have adverse side-effects, especially due to their lengthy and irrational use. For this reason our particular attention is paid to non-medicamentous methods of treatment that can substitute or considerably restrict a need for medicinal agents by producing a positive effect on different sides of pathological process. One of such methods is the therapeutic use of ozone-oxygen gas mixture (medical ozone) widely spreaded in our country and abroad.

Ozone-oxygen therapy (ozone therapy) is a method of oxidative therapy widely used in clinical practice over the last years. The systemic action of ozone therapy promotes activation of the organism's antioxidant defense and oxygen-dependent reactions as well as improvement of blood microcirculation. Moreover, through the local use of ozone-oxygen mixture it comes to anti-inflammatory and oxidative effects of ozone providing its bactericidal action.

In the clinic for skin and venereal diseases of the Moscow Medical Academy after I.M.Setchenov in the period from 1993 until now ozone-oxygen therapy was provided to more than 1000 patients with different skin diseases (eczema, psoriasis, skin angiitis (vangiitis) etc). In the Institute of plastic surgery and cosmetology ozone-oxygen therapy has been used over 3 years for correction of cosmetic defects (aging atrophy of face and neck skin, acne disease) as well as for complex rehabilitation after plastic surgery.

The Methodical Recommendations have summarized the gathered experimental and clinical material on the use of ozone therapy, indications and contraindications for its use, clinically tested treatment protocols.

## **2. Formula of the Method**

The recommended method of treatment is different from the available ones as its main active component is an ozone-oxygen gas mixture (medical ozone) with different ozone concentrations that is produced by means of special ozonization equipment approved for medical use by the Russian Ministry of Health (Medozons-BM). Thanks to different modes of administration medical ozone can be used at local level or parenterally introduced into the human body in gaseous phase directly or through a neutral intermediate such as physiological saline solution or distilled water. As a result, it comes to powerful anti-inflammatory, analgesic and antipruritic effects, normalization of balance between the level of lipid peroxidation and the activity of antioxidant defense,

an increase in efficiency of skin microcirculation. Treatment with ozone-oxygen gas mixture can be carried out as a monotherapy or a part of complex treatment.

### **3. Modes of Ozone Therapy**

#### **3.1. Modes of Systemic Ozone Therapy.**

##### **Intravenous Drop-by-Drop Infusion of Ozonated Physiological Saline.**

Ozonated physiological saline is produced by conveying an ozone-oxygen gas mixture through a standard glass bottle (or plastic container) with 200-400 ml of sterile physiological 0,9% sodium chloride solution (further – saline) to saturation and then intravenously drop-by-drop infused to the patient.

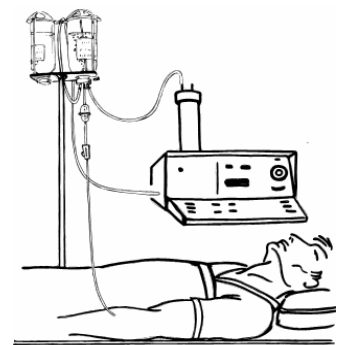
There are two variants of this procedure:

- 1) First ozonize saline for 10 minutes and then without stopping ozonization start its intravenous drop-by-drop infusion to the patient at a rate of 70-90 drops per min (3 – 4,5 ml/min). Stop ozonization when the bottle contains not more than 40 - 60 ml of infusion solution.
- 2) First ozonize saline completely and then intravenously drop-by-drop introduce it to the patient. Take into consideration that half-time of ozone in saline is about 30 min, therefore ozone concentration required for ozonization should be increased by 50%. Ozonization of saline lasts for 15-20 min. The produced solution should be infused to the patient immediately after ozonization. Infusion rate should be possibly increased. But if the bottle contains 400 ml of saline or infusion rate is not high enough, the required ozone concentration may be not kept in saline up to the end of procedure.

This variant of procedure is suitable for patients who for different reasons cannot be transported to the place of ozonization.

It is recommended to perform this procedure daily or every two days, number of procedures per treatment course ranges from 6 to 12. After the procedure the patient needs a rest for 3-5 min. The repeated treatment course can be performed in 3-5 months.

Physiological saline solution is usually bubbled with low ozone concentrations in gas mixture ranging from 400 to 2500 mcg/L at a flow-rate of 1 L/min. The conducted investigations have shown that ozonated saline does not contain any foreign compounds. Infusion solutions should be used at room temperature that increases the stability of ozonated solutions and the level of ozone saturation.



### **Subcutaneous or Intracutaneous Injections of Ozone-Oxygen Gas Mixture.**

As a rule, gas mixture is injected on the periphery of the damaged area (ulcer, chronic eczema, furuncle, pyoderma, dermatitis, psoriasis etc) as well as for cosmetic procedures (correction of aging skin atrophy, mimic i.e. facial expression-related wrinkles). Subcutaneous ozone injections are carried out at ozone concentration of 1000 to 5000 mcg/L and volume of 5 to 50 ml per each pathological area. Volume of gas mixture injected into each point is 1-2 ml. The procedure is carried out by means of hypodermic needle attached to a disposable syringe. Frequency of this procedure can be daily or every two days. Duration of treatment depends on the clinical picture of disease. The procedure is painful, but pain and burning sensations disappear quickly changing to long-lasting pleasant feeling of heat.

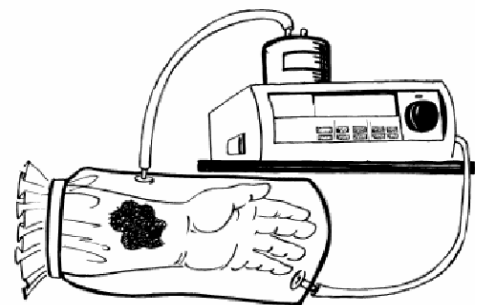
### **3.2. Modes of Local Ozone Therapy.**

#### **Local Gas Irrigations with Ozone-Oxygen Gas Mixtures.**

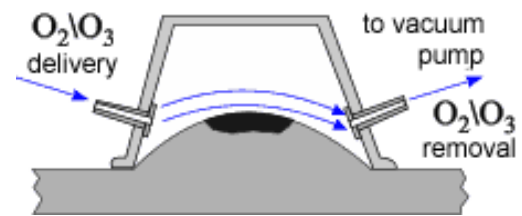
This procedure is carried out by means of special chambers made of ozone-resistant materials ("suction cup", "boots" or "bags" fitting various parts of the body). When ozone-oxygen gas mixture is used at local level, it is important to note that ozone acts on moist areas only, therefore before the procedure the surface of the damaged area should be moistened with water or physiological saline. Ozone concentrations used for gas irrigations range from 10000 mcg/L (for bactericidal effect) to 1000 mcg/L (for reparative effect). Flow-rate of gas mixture is 1 L/min. Treatment time ranges from 15 to 30 min to be chosen individually.

Gas irrigations are carried out as follows: the damaged area is covered with a napkin moistened with physiological saline or distilled water. The limb is placed into a plastic chamber with two jets: 1 – for delivery of ozone-oxygen mixture from the ozone generator; 2 – for removal of residual (excessive) ozone to a catalytic destructor. The chamber is her-

metically fastened onto the limb by means of rubber bandage. The chamber is filled with ozone-oxygen gas mixture at the given ozone concentration until overpressure is created, then connect the destructor and start the procedure of continuous-flow gas irrigation.

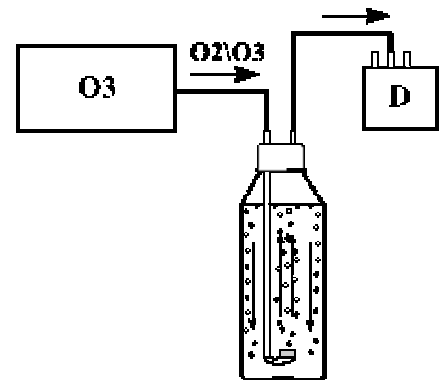


At places where plastic chambers are not applicable, use the so-called cap or half-sphere (made of hard plastic material) which has 2 jets: for delivery of ozone-oxygen gas mixture and removal of residual ozone to a destructor or vacuum pump.



### **Irrigations with Ozonized Distilled Water or Physiological Saline.**

Ozone concentrations used for ozonization of water range from 5000 to 10000 mcg/L. Ozonization time of 1 L of water is 20 min. Flow-rate of ozone-oxygen gas mixture is 1 L/min. A longer time of ozonization does not lead to further increase in the amount of dissolved ozone. For ozonization of water use a glass or plastic container with sealing screw cap fitted with a special diffuser for delivery of ozone-oxygen gas mixture. The other jet of the screw cap is intended for removal of residual ozone to a destructor.



Since half-time of ozone in distilled water at room temperature is approx. 30 min, it is recommended to use ozonized water immediately after its production. Fresh prepared ozonized distilled water can be stored in the fridge for approx. 1 hour.

## **4. Indications for Ozone-Oxygen Therapy in Dermatology**

Ozone-oxygen gas mixture with different ozone concentration produced from medical oxygen by means of medical ozone generator can be used to administer both a local and systemic effect on the human body depending on the nosology. The procedures of local and systemic ozone therapy can be carried out as a monotherapy or in combination with medicamentous and (or) other physiotherapeutic methods. There are the following biological effects of medical ozone to be realized:

- When ozone is used at local level (local gas irrigations with ozone-oxygen gas mixture, local applications of ozonized distilled water), of great benefit are its oxidative properties providing a bactericidal, fungicidal and virucidal effect. And in contrast to many well-known antiseptics ozone neither irritates nor destroys investing tissues of the human body as unlike the microorganisms the cells of the many-cell human body have an antioxidant defense system.

- Through systemic (parenteral) ozone therapy it comes to a many-component effect of therapeutic doses of ozone on the human body. As soon as ozone gets to blood flow it comes to its interaction with erythrocyte membranes resulting in formation of ozonides that initiate function of the intracellular antioxidant system (I.V.Kosheleva, 2001). Systemic ozone therapy makes easier release of oxygen by oxyhemoglobin and thereby improves oxygen supply of tissues. It is important to point out a positive effect of ozone on microcirculation processes: according to our data, efficiency of skin microcirculation in patients with eczema increased by 32,5% after local ozone therapy, and by 26,6% - after systemic ozone therapy (A.G.Kulikov et al., 2000; I.V.Kosheleva et al., 2003).

There is evidence about the immunomodulating effect of ozone. Medical ozone is in a position to correct the damaged cellular immunity as well as produce a modulating influence on the humoral link of immunity. Our experimental and clinical investigations have pathogenetically proved applicability of ozone-oxygen therapy that has an effect on the disturbances of enzymatic systems, oxidative cell processes, non-specific factors of defense and immune reactivity. The use of this method in the complex treatment of some dermatosis activates reparative processes and metabolic activity in the damaged area, contributes to improvement of the patient's general state and reduces treatment duration. The results of our clinical-morphological and cytochemical investigations serve as proofs for efficiency of ozone-oxygen therapy in the complex treatment of some dermatosis.

The most convincing clinical effect through ozone therapy was received in the following nosologies:

#### ***4.1. Ulcerous Forms of Skin Angiitis.***

In some cases (small number of ulcerous defects, insignificant manifestation of skin inflammation on their periphery, general satisfactory state of patients) it is effective to use an ozone-oxygen gas mixture as a monotherapy, but more often ozone therapy is used as a component of the standard therapeutic complex (antibiotics, antihistaminic agents, epithelizing ointments etc). The following modes of ozone therapy are recommended for use:

- continuous-flow gas irrigation of the limb affected with ulcer by means of ozone-oxygen gas mixture;
- intravenous drop-by-drop infusion of ozonated physiological saline.



For the procedure in the form of gas irrigation with ozone-oxygen gas mixture ozone concentration can be varied as follows: first perform active disinfection of ulcerous defect (ozone concentration in gas mixture up to 10000 mcg/L) and then stimulate tissue reparation by decreasing ozone concentration in gas mixture up to 5000-2000 mcg/L. Duration of treatment is 30 min, frequency – twice a week, 5-7 procedures per treatment course to complete healing of ulcerous defect. Before the procedure of local ozone therapy the surface of the damaged limb should be cleaned from oily medicaments; therapy with ointments is to be performed strictly after the procedure of continuous-flow ozone gas irrigation. The procedures of systemic ozone therapy (intravenous drop-by-drop infusion of ozonated physiological saline) support a therapeutic effect; 8-10 infusions per treatment course. The repeated courses of ozone therapy may be carried out in case of necessity (recidivation of ulcerous affection), but not more often than once within 3-4 months (O.L.Ivanov et al., 2003).

#### **4.2. Chronic Pigment Purpura**

In case of petechial and telangiectodic types of purpura and disease duration of maximum 2 years in order to achieve a stable positive effect it would be enough to carry out a course of ozone therapy in the form of intravenous drop-by-drop infusions of 200 ml of ozonated physiological saline bubbled with ozone concentration in gas mixture of 2000 mcg/L (6-8 procedures per treatment course 3 times a week) in combination with traditional external therapy with ointments. In case of eczematoid type of purpura systemic ozone therapy should be complemented with continuous-flow gas irrigations of shanks 2-3 times a week, 5-6 procedures per treatment course, ozone concentration in gas mixture 4000-7000 mcg/L. In order to support the positive effect of treatment it is recommended to repeat the course of intravenous drop-by-drop infusions of ozonated physiological saline in 6 months (pic. 1a, b).

#### **4.3. Eczema and Other Itching Dermatoses**

The following modes of ozone therapy are to be used:

- continuous-flow gas irrigations of damaged areas with ozone-oxygen gas mixture through a hermetically closed plastic chamber; ozone concentration from 2000 to 10000 mcg/L; duration of treatment for 15-30 min, frequency 2-3 times a week, 6-9 procedures per treatment course;

- irrigations, compresses and moist-drying bandages with ozonized distilled water – daily for 10-15 min, 2-3 times a day, ozone concentration required for ozonization of water up to 10000 mcg/L;
- intravenous drop-by-drop infusions of 400 ml of ozonated physiological saline bubbled with ozone concentration in gas mixture of 2000 mcg/L 3 times a week, 5-9 procedures per treatment course.

In most of patients (almost 80%) ozone-oxygen therapy is used as a component of traditional treatment that includes antihistaminic agents, enterosorbents, ointments. In rest of patients ozone-oxygen therapy can be used as a monotherapy (i.e. in combination with indifferent ointments).

Ozone therapy has a positive effect on the main clinical appearances of eczema (itch, acute-inflammatory skin appearances, excoriations etc). Practically in all patients after 2-4 procedures of ozone therapy it comes to obvious clinical improvement manifested as disappearance of itch, moisture and secondary pyodermic eruptions, improvement of general state (I.V.Kosheleva, A.G.Kulikov, 2001). The treatment in the form of continuous-flow gas irrigation has the similar efficiency in patients with different forms and stages of eczematous process. The procedures with ozonized distilled water are applicable for moist eczema (pic. 2a, b).

In the treatment of eczema and other itching dermatosis (atopic dermatitis, prurigo etc) with a small damaged area of skin and general satisfactory state of patient local ozone therapy can be carried out as a monomethod. If necessary, the treatment can be supported by the procedures of systemic ozone therapy (intravenous infusions of ozonated physiological saline). The repeated courses of ozone therapy are reasonable in case of skin process aggravation or for preventive purpose 2-3 times a year (I.V.Kosheleva, 2001).

#### **4.4. Pyoderma and Acne Disease**

The following modes of ozone therapy are recommended for use:

- subcutaneous injections of ozone/oxygen gas mixture into pustular elements (0,5-3 ml of gas mixture at ozone concentration of 5000 mcg/L) 3-4 times a week, 6-8 procedures per treatment course;
- intravenous drop-by-drop infusions of 400 ml of ozonated physiological saline bubbled with ozone concentration in gas mixture of 2000-2500 mcg/L (3 times a week, 10 procedures per treatment course);

- continuous-flow gas irrigation of pyodermic area on the limb with ozone-oxygen gas mixture (ozone concentration in gas mixture up to 10000 mcg/L, duration of irrigation 15 min, 4-5 procedures per treatment course);
- Irrigations of damaged areas with ozonized distilled water (ozone concentration used for ozonization of water up to 10000 mcg/L, daily, to complete elimination of pus from skin).

In case of purulent skin lesions and acne disease medical ozone in the form of subcutaneous injections of gas mixture into damaged areas or inside furuncle or acne (infiltrative and pustular elements) can be successfully used as a monotherapy. The lipolytic properties of ozone help to influence on the accumulated skin fat in cystic formations, and improvement of blood circulation at places of injections accelerates resorption of scar modifications (I.V.Kosheleva, 2000). In some cases subcutaneous injections of ozone-oxygen gas mixture are carried out after their sanitation by method of electrocoagulation (opening and removal of purulent content). In all patients with acne disease after the 1<sup>st</sup> procedure it comes to clinical improvement manifested as softening of infiltrates, decrease in painfulness, hyperemia and swelling.

Treatment duration was reduced by 2-3 times as compared with traditional methods of treatment. Any complications and side-effects were not observed. One treatment course consisted of 5-6 procedures every 5 days. Before the procedure skin was treated with disinfectant lotion, then local ozone injections into inflammatory areas were carried out. Ozone concentration in gas mixture 3000-5000 mcg/L, up to 5 ml to be injected into each point. Depth and number of injections depend on the quantity and size of inflammatory elements.

Through local ozone therapy (local gas irrigations, irrigations with ozonized distilled water) it comes to a powerful bactericidal effect of medical ozone. The use of intravenous infusions of ozonated physiological saline as a part of complex treatment for general anti-inflammatory and immunomodulating purpose is recommended in extensive purulent lesions of skin, acne disease of III-IV stage as well as in case of the patient's intolerance to antibiotics (pic. 3a, b).

#### ***4.5. Focal Alopecia.***

The cytochemical methods used in our investigations established disturbances of enzymatic activity and biochemical status of cell in patients with focal alopecia at very initial stages of pathological process that contributed to early recognition of immunological shifts, disturbances of oxidoreduction processes in the human body,

inflammatory reaction, hypoxia. The pathomorphological investigations of head skin biopsates taken from patients with alopecia showed degenerative modifications of hair follicle epithelium, a decrease in the intensity of hemomicrocirculation bed, balance of papillary relief, presence of lymphohistocyte infiltrates localized in perivascular and perifollicular areas. The examination of patients with focal alopecia pointed out the manifested insufficiency of cellular antioxidant defense and the picture of chronic tissue hypoxia. There were established obvious changes in cytochemical indices related to energetics, activity of lysosomes, processes of lipid peroxidation and antioxidant defense in the lymphocytes and neutrophils. Along with disturbances of biochemical status of the leukocytes in patients with alopecia it comes to a decrease in the total number of the lymphocytes, number of the T-helpers, disturbance of the immunoregulatory index (correlation between the T-helpers and T-suppressors) that reflects formation of quantitative-functional immunodeficiency. The analysis of the received results has pathogenetically proved applicability of the method of ozone-oxygen therapy.

It has been proposed and pathogenetically proved that in the treatment of focal alopecia ozone-oxygen therapy can be used as a method of metabolic action improving energetics in cells and tissues, regulating metabolic processes, particularly focused on elimination of chronic tissue hypoxia. It has been also demonstrated that combination of several methods within one cycle (course) of treatment can considerably intensify the course of natural compensative mechanisms in chronic tissue hypoxia (I.V.Kosheleva, Ya.A.Petinati, 2003).

Ozone-oxygen therapy was carried out in the form of intravenous drop-by-drop infusions of 200 ml of ozonated physiological saline bubbled with ozone concentration in gas mixture of 1500 mcg/L, 3 times a week, 10 procedures per treatment course; at the same time some patients received subcutaneous injections of ozone-oxygen gas mixture into the focuses of alopecia directly, at frequency 1-2 times a week, 5-7 procedures per treatment course (ozone concentration in gas mixture 2000-3000 mcg/L). There were carried out on average 2-3 courses of ozone-oxygen therapy at an interval of 2-3 months.

Clinical efficiency of the given therapy was compared with the indices of immunocytochemical reactions conducted before and after the treatment. After the therapy it came to an increase in the level of energy enzymes to normal values or manifested stimulation of their activity in the lymphocytes. The most drastic change through the therapy was observed regarding the activity of alpha-GHDG. In case of

slight focal alopecia the activity of this enzyme increased up to  $13,6 \pm 0,4$  units that was reliably higher as compared with the data before the treatment. In case of alopecia of moderate severity the activity of alpha-GHDG increased from  $9,1 \pm 0,3$  units to  $11,9 \pm 0,3$  units and gradually reached normal values. In case of severe focal alopecia average values of this index in this group increased from  $6,84 \pm 0,64$  units to  $9,2 \pm 0,5$  units, did not reach the level of control group, but showed a stable tendency towards normalization. The enzymatic activity of the neutrophils after the treatment also underwent change as compared with the initial level. Through the therapy it comes to a decrease in the activity of oxygen radicals, tendency towards normalization of hydrolytic enzymes and myeloperoxidase. After the treatment the patients of all groups showed a decrease in the number of the reductant neutrophil leukocytes that testifies to normalization of metabolism of these cells. There was also registered positive dynamics towards normal values of quantity and correlation of the main subpopulations of the lymphocytes (a decrease in the T-suppressors, an increase in the T-helpers and IRI).

Our investigations have established that complex treatment including ozone-oxygen therapy exerts a stimulating influence on the decreased metabolic activity of the leukocytes in patients with focal alopecia. The use of ozone therapy has shown that in the damaged tissue in response to the effect of oxygen under pressure it comes to vasodilatation and improvement of microcirculation that contributes to elimination of regional hypoxia.

The role of ozone therapy is also important in the practice of dermatocosmetologists: for correction of aging skin modifications and as an adjuvant anti-inflammatory medicine in the reparative period after plastic surgery.

#### ***4.6. Aging Atrophy of Face and Neck Skin, Mimic Wrinkles***

For prevention of skin aging, rejuvenescence and correction of mimic wrinkles ozone-oxygen therapy was used in the Institute of plastic surgery and cosmetology in 310 patients, mostly women at the age of 25 to 65 years. They received subcutaneous injections of ozone-oxygen gas mixture into the points at places of wrinkles and other areas with fading skin signs (chin, neck etc) as well as in case of excessive quantity of subcutaneous tissue in submaxillary and cheen-chin areas (pic. 4). For correction of wrinkles around the eyes volume of ozone-oxygen gas mixture to be injected is 0,2-0,5 ml into each point, for forehead and nosolabial fold - 0,4-1 ml into each point, for neck - about 1 ml into each point. Depending on the depth of wrinkles and excess of subcutaneous tissue the total volume of ozone-oxygen gas mixture to be injected per

one session can range up to 50 ml. Number of procedures per treatment course: 10-12, frequency of procedures 1-2 times a week; ozone concentration in gas mixture 1000-1500 mcg/L. It is recommended to carry out one treatment course over 6 months and 1 supporting procedure – once a month.

Any complications were not observed, adverse reactions were manifested in the form of surface, through standard local anti-inflammatory agents regressing hematomas at places of injections. After the procedure the patients received manual plastic or cosmetic massage for more equal distribution of ozone-oxygen gas mixture.

There is successful experience on the use of ozone-oxygen therapy in a complex with other methods, for example, peelings with ANA-acids. The procedure of injections with ozone-oxygen gas mixture was carried out immediately after peeling or next day. In case of complex treatment there was observed a better manifested therapeutic effect: combination of several procedures potentiated the effect of each considerably improving appearance of face skin and providing better penetrance of cosmetic preparations recommended for home care. It came to improvement of biomechanical properties of skin that was visually manifested as obvious ironing of wrinkles, balance of color and skin relief. Number of procedures and kind of peeling is chosen individually for each patient; one treatment course consists on average of 10 procedures of ozone-oxygen therapy and 3-5 procedures of peeling with glycolic acid.

#### ***4.7. Postoperative Conditions (Swellings, Tissue Infiltration, Scars)***

For faster rehabilitation after the surgery for removal of face and neck skin excess in the Institute of plastic surgery and cosmetology 44 patients received ozone-oxygen therapy in the form of subcutaneous injections of ozone-oxygen gas mixture with ozone concentration of 1500-2000 mcg/L. Number of procedures per treatment course: from 5 to 10, frequency of procedures – daily or every two days. Volume of ozone-oxygen gas mixture to be injected into each point is 1-2 ml.

From our experience we know complications after the surgery for removal of face and neck skin excess. For example, in the early postoperative period one patient manifested development of tissue necrosis in paratotic area, formation of extensive erosive-ulcerous surface (pic. 5a). She received ozone-oxygen therapy in the form of local subcutaneous injections of ozone-oxygen gas mixture at ozone concentration of 1500-2000 mcg/L into the damaged area. Procedures were performed every two days, 10 procedures per treatment course. A positive effect was manifested after 4 procedures as a decrease in inflammation, tightening of wound edges, activation of

epithelization and, as a result, a decrease in sizes of pathological process (pic. 5b). Complete epithelization came after 10 procedures (pic. 5c).

## **5. Contraindications for Ozone Therapy:**

Our numerous clinical observations have shown that side-effects due to ozone-oxygen therapy are very rare and mostly related to incorrect technique of administration. Nowadays, the following contraindications for ozone therapy are approved:

- 1) inborn deficiency of glucoso-6-phosphatedehydrogenase (favism) i.e. in this case the erythrocytes have a deficiency in defense against oxidants;
- 2) early period after different (including internal) bleedings as owing to hypocoagulation effect of ozone it can aggravate the increased tendency to bleedings;
- 3) all disturbances of blood coagulation;
- 4) thrombocytopenia;
- 5) hyperthyroidism;
- 6) acute myocardial infarction;
- 7) hemorrhagic insult;
- 8) acute alcohol intoxication;
- 9) cramps in the anamnesis;
- 10) chronic, often recidivating pancreatitis;
- 11) allergic reaction to ozone.

Since ozone in low concentrations has a moderate hypocoagulation effect, during ozone therapy it is necessary to reject the use of medicinal agents stimulating a decrease in blood coagulation (aspirin, anticoagulants etc). For the period of menstruation women should make a break in the treatment with ozone.

## **6. Efficiency of Ozone-Oxygen Therapy**

The use of ozone-oxygen therapy in patients with different inflammatory diseases of skin allowed achieving fast elimination of inflammatory appearances, improvement of healing processes. In the most numerous group - in patients with different forms of eczema - positive results of treatment were registered in 83-88% of cases. The analysis of remote results one year after the treatment course has established that among the patients treated with local ozone therapy 3 months after the treatment aggravation was observed in not more than 12% of patients, and one year after the treatment – not more than 19% of patients. Systemic ozone therapy has proved to be more effective – one

year after the treatment course aggravation was registered in 10% of patients only. The best results were received through the combined use of systemic and local methods of treatment: clinical remission was stable in all patients; one year after the treatment course aggravation of eczematous process was observed in 5% of patients only (I.V.Kosheleva, 2001). Only in single cases the performed treatment did not have any positive effect. All the above-mentioned can be considered as proofs for manifested therapeutic efficiency of the given method in the dermatocosmetological practice, its applicability and potential in the treatment of eczema and other itching dermatosis. Complex treatment with medical ozone has proved to be more effective as compared with the traditional one: an increase in recovery percentage, a decrease in disease recidivations, and the therapeutic effect comes earlier as compared with the treatment by traditional methods only.

Efficiency of ozone-oxygen therapy in patients with ulcerous forms of skin angiitis was registered in about 73% of patients that was manifested as complete clinical recovery (healing of ulcerous defect) or significant improvement. It is important to note that a positive effect of treatment was observed in patients that received at least 2 courses of treatment with ozone-oxygen gas mixture at an interval of 4-6 months. After 2-3 courses of treatment over 1-1,5 years remote results of our observation were manifested as stable remission of skin pathological process in about 60% of patients (I.V.Kosheleva et al., 2003).

Among the patients with chronic pigment purpura efficiency of ozone-oxygen therapy was approx. 83%. After 2 courses of systemic ozone therapy over one year a stable positive result was preserved in absolute majority of patients.

In the treatment of patients with pyoderma and acne disease efficiency of treatment was approx. 85%. In case of pyoderma ozone-oxygen gas mixture can be successfully used as a monotherapy, and in acne disease it is recommended to use it in combination with other therapeutic agents including retinehormone-containing preparations, external remedies regulating secretion of skin oil glands. It is recommended to perform repeated courses of treatment in the form of subcutaneous injections of ozone-oxygen mixture into acne 1-2 times a year, preferably in autumn/winter time.

In patients with alopecia in some cases ozone-oxygen therapy was used in combination with local ribbing of regain into bald areas. Efficiency of therapy was evaluated visually during regular examination of patients in the course of treatment. The final analysis of results has shown that active growth of wool hair started earlier in



patients that received combined therapy (N.G.Kotchergin et al., 2002). On the whole, efficiency of ozone therapy in patients with alopecia was 41%.

Efficiency of ozone-oxygen therapy for correction of aging skin atrophy and mimic wrinkles was 85-90%. A positive effect was observed already after 3-4 procedures and manifested as ironing of small wrinkles, an increase in skin turgor, a decrease in pastosity, improvement of face color, a decrease in drying and skin constriction sensation, lifting effect in submaxillary and cheen-chin areas, improvement of general state. It is recommended to perform supporting courses of treatment 2-3 times a year.

Efficiency of complex rehabilitation of postoperative conditions with inclusion of ozone-oxygen therapy is 100%. In all patients a positive effect took place after 1-2 procedures and manifested as a decrease in painfulness, hyperemia, edema and tissue infiltration. After 4-5 procedures it came to restoration of skin sensitivity, a decrease in constriction sensation in the field of postoperative scars.

Owing to many-sided therapeutic action of ozone, its use within a treatment complex allows considerably increasing efficiency of the performed therapy.

Efficiency of the methods of ozone therapy described in the present Methodical Recommendations is confirmed by scientific achievements of the Department for skin and venereal diseases of the Moscow Medical Academy after I.M.Setchenov, Laboratory for research of reparative skin processes at the Moscow Medical Academy after I.M.Setchenov and Institute for plastic surgery and cosmetology at the Russian Ministry of Health.

Pictures:



Pic. 1a: Chronic pigment purpura (before treatment)



Pic. 1b: Chronic pigment purpura (after ozone therapy)



Pic. 2a: Dyshydrotic eczema (before treatment)



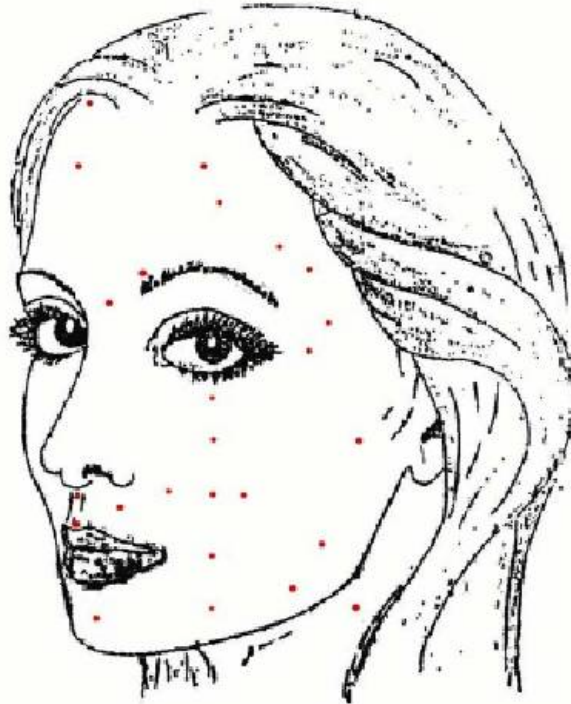
Pic. 2b: Dyshydrotic eczema (after ozone therapy)



Pic. 3a: Acne disease (before treatment)



Pic. 3b: Acne disease (after ozone therapy)



Pic. 4: Schema of injections with ozone-oxygen gas mixture on face and neck areas





Pic. 5a: Postoperative complication – necrosis of soft tissues



Pic. 5b: Necrosis of face soft tissues – in the course of ozone therapy



Pic. 5c: Postoperative complication – necrosis of soft tissues – after the course of ozone therapy