HALOTHERAPY OF RESPIRATORY DISEASES

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The physical methods aimed to correct and support the protective properties of organism and the optimization of medication load, have a significant impact on the prevention and rehabilitation treatment stages. In patients with respiratory tract pathology the aerosol therapy methods with application of natural factors, which effect the respiratory system have been proved to be especially perspective.

Halotherapy – present-day development of speleotherapy method

Among the methods of the artificially replicable climatic factors halotherapy (HT) has held increasingly stable positions. HT originates from speleotherapy (ST). ST (from Greek *speleon* =cave) is a therapeutic method based on prolonged staying under the specific microclimate of karst caves, grottoes, salt mines and etc.

Separate line of ST proved to be the treatment under the salt cave microclimate (generally the old salt mines). Extensive treatment experience in patients with different respiratory diseases (RD) confirmed a high efficiency of ST under the conditions of salt mines Velichka, Solotvino, Nakhichevany, Chon-Tuz and others. Researches have shown that within the process of treatment human organism adapts to the specific particularities of microclimate and as a result the reorganization of the all functional systems activity of the body occurs [13]. Air of such caves saturated with fine salt aerosol of certain concentration that varies within 1 to 20 mg/m^3 (generally from 2 to 5mg/m^3) provides the main therapeutic effect.

Since mid 80's the there have been initiated attempts to simulate the microclimate of salt medical clinics under the ground-base conditions. Parameters of artificial aerodisperse environment to be created in rooms should have certain characteristics that are similar to natural conditions and adapted to the curative room environment.

At present time the curative microclimate simulation methods are focused as follows. The first proposed and the most primitive one is the covering of the walls with salt blocks. It was found that it has been impossible to create a dry fine salt aerosol environment under the conditions of rooms when applying only the passive means as the wall salt covering with sodium chloride (halite) or sylvinite [6]. This method is ineffective to produce aerosol and air sanitation and can be used only as room decoration.

In rooms where the prospective salt aerosol source is represented by, so called, saturating filters, labyrinth partitions, ventilation systems together with the salt blocks, the aerosol particles concentration, as a rule, is inappreciable or they are absent; the necessary dispersibility (respirable fraction content) is not replicated, controlled and considerably dependent on premises characteristics. So, in buildings, which are not equipped with the facilities to produce aerosol with necessary characteristics (concentration, size of particles) and to monitor the microclimate environment parameters there is no possibility to dose procedures.

Significance of dosing and monitoring the curative air parameters is even greater when applying microclimate of artificial sylvinite speleoclimatic chambers, where increased aeroionization, generated by radioactive γ- and β - decay ^{40}K contained in sylvinite [7] is one of the acting factors. Potassium content in sylvinite formations varies significantly (17 to 43%) and moreover, there are differences in the salt block thickness, premises dimensions, ventilation and filters work rate, present patient number and etc. As a result aeroion production may vary from therapeutically minor to significantly major values.

HT technical realization with ultrasonic generators or other salt solution spraying devices is incorrect as resultant physicochemical characteristics of aerosol are very different with the dry salt aerosol. Aerodisperse environment of humid aerosol in room is almost impossible to control and dose. Sodium chloride aerosol produced in this manner does not have any curative effects in comparison with dry haloaerosol. Furthermore, high humidity in rooms considerably limits the indications for this method.

Thus, it is necessary to take in account that using of artificial microclimate of salt caves as a preventive or curative method requires the corresponding facilities including technical equipment that provides dosing and monitoring of the procedures to be taken under the according documentary permission.

Among the different names of facilities to replicate the salt cave microclimate the name "halochamber" is the most commonly accepted and this method has come to be called as halotherapy ("*hals*" – is a "salt" in Greek). Use of the terms "speleoclimatic chambers", "speleotherapy" is probably less acceptable as underground (cave) conditions are not simulated there.

Thus, halotherapy (HT) is the mode of treatment in a controlled air medium which simulates a natural salt cave microclimate. Medical requirements to this method combined with technical solutions allowed to develop a new medical technology, i.e. a controlled curative microclimate of halochamber [15].

The main curative factors of halotherapy under conditions of a controlled microclimate:

Fine dry salt aerosol within the range (0.5 mg/m^3 to 10 mg/m^3) with the controlled curative concentrations (modes) in accordance with the method of Ministry of Health of Russian Federation [18]. The basic mass of aerodisperse environment particles (more than 97%) is composed of respirable fraction (1–5 mkm) which allows such aerosol effectively influence everywhere including the deepest parts of respiratory passages. Physicochemical properties of dry aerosol determine specific character of HT method, which feature proved to be the multicomponent curative effect of extremely small doses of substance.

Hypobacterial and allergen-free air environment. Depending on the operational mode the quantity of salt aerosol particles in one liter of air totals from 0,4x10^5 particles/l to 4,6x10^7 particles/l. Availability of salt aerosol forms in curative room environment free from microorganisms and allergens.

Aeroionization. When powdering in halogenerators the salt particles due to a heavy mechanical action acquire a negative charge and high surface energy. When interacting with air molecules its aeroionization occurs (6 - 10 nK/m^3). Light negative ions are the additional factors of therapeutic effect on organism and room environment clearance. Such natural way of aeroionization is the most physiological and safe.

Optimal density of aerosol and aeroions generated with such technology gives the maximal therapeutic effect.

Stability of optimum microclimatic parameters. Air curative environment has a stable humidity (40-60%) and constant temperature (18-24°C) that are the most beneficial and comfort for respiratory system.

Application of rock-salt of natural deposits (Solotvino, Sol-Iletska, Artemovska and others). This salt has natural physical properties and is composed of the lowest impurity content (Russian State Standart 51574-2000 "Table salt"). Special development of this kind of salt is not required. Extremely small doses of sodium chloride neither cause irritation nor increase bronchial mucosa reactivity that are observed when applying the hypersmolar solutions in a number of patients with bronchial asthma (BA) and other pulmonary pathology.

Design of natural salt cave and aesthetic appeal. They have positive effect on psycho-emotional field and create comfort conditions to take this procedure.

Pathophysiologic foundations of curative action of halotherapy

Experimental and clinical data allowed expressing the vision about preventive and curative effect of the main operative factor of HT [15, 17]. Dry fine sodium chloride aerosol (haloaerosol) when improving the rheological properties of bronchial mucus and contributing to mucociliary activity has a mucoregulatory effect and improve the drainage function of respiratory system. Due to the physicochemical properties this action is effectively provided in the deep hard-to-reach parts of respiratory tract. When acting as a rehydratant haloaerosol decreases bronchial walls edema and contributes to improvement of microcirculation. Dry fine sodium chloride aerosol takes inhibitive effect on bacterial growth and activity followed by the degradation pathogenic properties. Natural antimicrobial effect comparing to sodium chloride does not have any negative influence on the local protection and contributes to improvement of respiratory tract biocenosis. Furthermore, haloaerosol when acting as a physiological osmolar stimulus increases phagocytal activity, takes positive effect on other local immune and metabolic processes.

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Local sanogenic and anti-inflammatory action of dry fine sodium chloride aerosol have an indirect positive influence on the status of systemic humoral and cellular immunity, general nonspecific organism resistance, contributes to reduction of hyper sensitization level.

As a result of action of dry superfine sodium chloride aerosol on various mechanisms of patho- and sanogenesis of respiratory passages its mucolytic, bronchodrainage and anti-inflammatory effect is taken.

HT application improves bronchial passage in patients with different respiratory tract pathologies. Effect on bronchial patency is taken gradually on account of influence on its dyscrinic and edematous-inflammatory components. Improvement of drainage function and reduction of respiratory passages inflammation contributes to indirect decrease of hyperreactivity and reduction of bronchospasmolytic component of obstruction.

Present light negative aeroions activate metabolism and local protection of biological tissues; beneficially influence the cardiovascular and endocrine systems, gastrointestinal tract and respiratory mucosae, take adaptogenic effect on the organism central and peripheral stress-limiting systems. While staying in halochamber autonomic nervous system is stabilized and positive psycho-emotional effect is taken.

In the context of all the curative factors it was specified that a controlled halochamber microclimate has influence on:

- respiratory tract;
- immune system;
- cutaneous covering;
- cardiovascular system;
- autonomic nervous system;
- mental-emotional state.

Method of halotherapy

Modern halochamber represents two specially equipped rooms (Halocomplex of ZAO Aeromed, Russia). Patients are mainly placed in the principal (treatment) room in the comfortable armchairs. Aerodisperse environment is produced by halogenerator - special device for the dry salt aerosol therapy ACA-01.3. Halogenerator is positioned in the operator's room and feeds a flow of dehydrated and filtered air saturated with fine particles of salt aerosol to the treatment room. In order to maintain the predetermined optimal parameters of microclimate in the treatment room the sensors for continuous measurement of sodium chloride aerosol mass concentration are positioned. Microprocessor built in ASA-01.3 device handles the sensor signals and maintains the specified parameters of curative environment as referenced. Walls are covered with salt, which is the buffer capacity for atmospheric moisture and contributes to stabilization of aseptic environment. Salt covering serves as aesthetical appeal when creating a comfort perception while staying in cave. However, halochambers can adequately function without salt covering. Salt covering is not covered on the walls for economic reasons as well as in preschool institutions where playing situation and interior is created. Halocomplex without salt covering is usually called as haloroom.

HT course consists of 10-25 daily procedures for 30 minutes (for children) and 60 minutes (for adults). It is expedient to repeat HT courses 1-2 times a year for the patients with chronic pathology. During the session the patients (as a rule, 4-6 persons) are staying in armchairs. Generally, HT procedures are accompanied by quiet music; during the session quiet musical entertainment events or fairy tales are demonstrated for children. Within a day several (on average 6-8) HT sessions can be conducted. Between the sessions a room is ventilated.

There is a simpler and easier way to use dry salt aerosol aerodisperse environment for the curative purpose – Haloinhalation Therapy Method (HIT). Dry aerosol environment is created by the table set and aerosol gets directly to respiratory passages. HIT is conducted with haloinhalator "Haloneb" (series-produced by ZAO Aeromed, Russia). Distinctive feature of haloinhalator is proved to be ability to feed mainly respirable (1–5 mkm) dry salt aerosol fraction to the patient's respiratory system – more than 90 % of fraction composition. Special salt treatment for this device is not required.

HT and HIT methods provide for differential application of certain concentrations (modes) of dry fine sodium chloride aerosol depending on clinical features of RD and indices of respiratory function (RF) [16, 18].

Dynamics of disease clinical symptoms under the influence of dry fine sodium chloride aerosol is connected with its action on different pathogenetic mechanisms of bronchopulmonary pathology and primarily with its effect on dyscrinic obstruction component. During the treatment process the overwhelming majority of patients with different forms of chronic obstructive pulmonary diseases (COPD) demonstrate positive dynamics of symptoms that proved the disorders of respiratory drainage; decrease in cough frequency and intensity, easier expectoration of sputum, which becomes less viscous and changes in its nature. Such a dynamic of clinical symptoms is an evidence of mucociliary transport activation and intensification of respiratory drainage. The results of the factor analysis showed that dyscrinia syndrome influences HT efficiency in patients with COPD [1, 15]. In patients with broncho-obstructive syndrome of different stage accompanied by respiratory drainage disorders, HT is especially effective.

As a result of HT application cough is considerably reduced as well as the symptoms of day and nocturnal expiratory dyspnea. Against this fact demand for reduction of inhalant β_2–agonists is recorded; decrease of extrapulmonary allergy manifestations is observed. Significant differences in dynamics of the main respiratory symptoms in patients when applying both HT and HIT are not generally observed. These facts support that the dry fine sodium chloride aerosol proved to be a key factor in curative action and its application is possible both with halochamber and haloinhalator.

Change in clinical symptoms and syndromes are produced within certain terms of procedure course. In this connection the main dynamics profiles are noted. The 1st profile is “Gradual improvement”. This type of changes is the most common (40% cases). Dyscrinia and expiratory dyspnea manifestations in patients reduce gradually with the first week of treatment. Improvement of clinical symptomatology is confirmed by the positive dynamics of peak expiratory flow rate (PEFR) measurement. The 2nd profile “Dyscrinia intensification” (23%) demonstrates growth and intensification of dyscrinia syndrome during the first week of treatment with its subsequent positive dynamics. Minor transient decrease in the PEFR is fixed almost concurrently. The 3rd profile of the main clinical syndrome dynamics (22%) demonstrates gradual intensification of dyscrinia (for the first week of treatment) and expiratory dyspnea followed in 1-2 days. Upon overcoming the temporary deterioration the positive dynamics of cough, dyspnea and sputum nature is observed. Indices of PEFR demonstrate the clinical symptom dynamics: initial temporary decrease precedes the expiratory dyspnea symptom intensification and lasts 2-3 days longer. When this treatment is continued the positive dynamics is observed. Such shifts are the evidence of local reaction of bronchial passage and change in the total organism reactivity in response to application of the physical curative factor. In-process changes are treated as “haloreaction”, which positively influences the destruction of stable pathological process. Within these days it is necessary to add abundant drink to the treatment including fresh mineral waters. Depending on the health state and in accordance with the indications the chest massage, kinesiotherapy, drainage respiratory gymnastics, resistive breathing exercises, nebulized therapy and etc. can be used. The 4th profile of clinical presentation dynamics while undertaking HT course by patients “Dyspnea intensification” demonstrates the transient intensification of expiratory dyspnea symptoms and PEFR reduction against practically constant clinical presentation. Bronchial drainage and change in clinical pattern as compared with the initial one is not improved subsequently. Similar reaction to treatment is found in patients with bronchial asthma (BA) with clinical signs of primarily changed bronchial reactivity.

It was revealed that different nosological forms of COPD are characterized by the specific factors of clinical syndrome dynamics in response to HT. In patients with mild BA and chronic nonobstructive bronchitis (CNB) the gradual improvement of clinical presentation is generally observed. The factor “Dyscrinia and dyspnea intensification” is extremely incident to patients with serious case of BA. The factors “Dyscrinia intensification” and “Dyscrinia and dyspnea intensification” are mostly specific for chronic obstructive bronchitis (COB). “Dyscrinia intensification” type is more frequently found in patients with bronchiectases (BE). Nature of response to treatment depends on the initial level of bronchial patency. In patients with more massive obstruction disorders HT process may be accompanied by reaction “Dyscrinia and dyspnea intensification” It can be fully explained based upon haloaerosol mechanism.

HT may be applied as a main or adjunct to the drug therapy. When the clinical pattern and functional parameters are changed the recommendations to change doses of the baseline pathogenetic and symptomatic therapy (correct the administration of cromoglycates and nedocromils, corticosteroids, methylxanthines, β-agonists and others) are provided.

HT prescription for patients with chronic bronchopulmonary pathology within a decline period and remission contributes to achievement of maximum clinical effect with the optimum doses of drug therapy. Within a phase of incomplete remission HT primary purposes are proved to be the symptoms relief, which is insufficiently corrected with the baseline therapy, drug load reduction or drug cancellation. HT courses contribute to remission prolongation; its timely prescription prevents development of recurrent exacerbation in chronic patients. HT accelerates the process of full recovery at acute pathology especially in chronic cases. Within rehabilitation period, when drug application is frequently inexpedient and in some cases unnecessary, the application of this method is of current interest.

Indications for HT prescription proved to be practically all the most common respiratory diseases. As a rehabilitation method HT is prescribed to the patients with acute bronchitis (AB) and prolonged pneumonia, chronic nonobstructive (CNB) and obstructive bronchitis (COB), bronchial asthma (BA) of different severity and various clinical-pathogenetic treatment types including hormone-dependent forms, multiple bronchiectasis (MB), cystic fibrosis (CF).

Halocomplexes (halochambers and halorooms) may be organized in outpatient hospitals, physiotherapeutic, therapeutic, pulmonologic, rehabilitation departments of in-patient hospitals and sanatoria, medical units and sanatoria-preventoria of industrial plants, resorts and preschool institutions. Under conditions of outpatient clinics and hospitals the day patient facility is the most acceptable structural unit to undertake HT. Advantages of HT method with a controlled microclimate allows to recommend it for rehabilitation and recovery treatment of patients in sanatorium-resort institutions, SPA and rehabilitation centers.

Efficiency of halotherapy within rehabilitation treatment in patients with bronchopulmonary diseases

Adding of this method to the complex of recovery treatment and rehabilitation of patients with chronic bronchopulmonary pathology in recovery and stabilization phase allows to achieve the maximum clinical effect in 82 - 96% patients with optimum doses of drug therapy, contributes to improvement of the quality of life. Results of the controlled research showed that HT prescription enabled to achieve good results of treatment in a proved number of patients that demonstrate complete cessation of respiratory symptoms and respiratory function normalization or in patients with more severe cases – stabilization of clinical and functional parameters and bringing them to the individually optimum values (Fig. 1).

Data analysis of the long-term follow-up showed that upon taking the complex therapy with HT application in BA patients, remission is prolonged. At that, the stable remission within 6 months was observed in HT group in 62% and in control group – in 43% patients. In 83 % patients with mild BA remission persisted within a year and longer. In control group such a result was observed only in 67 % patients. In patients with moderate BA the average remission duration before treatment totaled 4.9 ± 0.8 months and upon taking HT course it totaled 6.4 ± 0.7 months ($p < 0.05$). Differences were reliable according to the symptom score as compared to the control group ($p<0.01$). Upon taking HT the number of urgent hospitalizations in BA patients decreased in 1.7 times. State stability in BA patients allowed reducing the range of baseline drug therapy in 3-5 months upon terminating HT course in the main group. More than a half (56%) of patients with moderate BA could reduce the maintenance dose of inhalation corticosteroids. Curative effects of HT in BA patients are realized completely against the adequate drug therapy. Application of dry superfine sodium chloride aerosol potentiates the drug action. It allows suggesting improvement of quality administration in BA patients when applying the complex therapy with HT.

The long-term follow-up of patients with CB and MB showed that upon taking HT remission in this category of patients was prolonged as well. If the average remission duration within a period preceding HT application in this category totaled 5.0 ± 1.0 months then remission duration within a period following HT totaled 8.2 ± 1.1 months ($p<0.05$). In CNB patients the average remission duration before treatment totaled

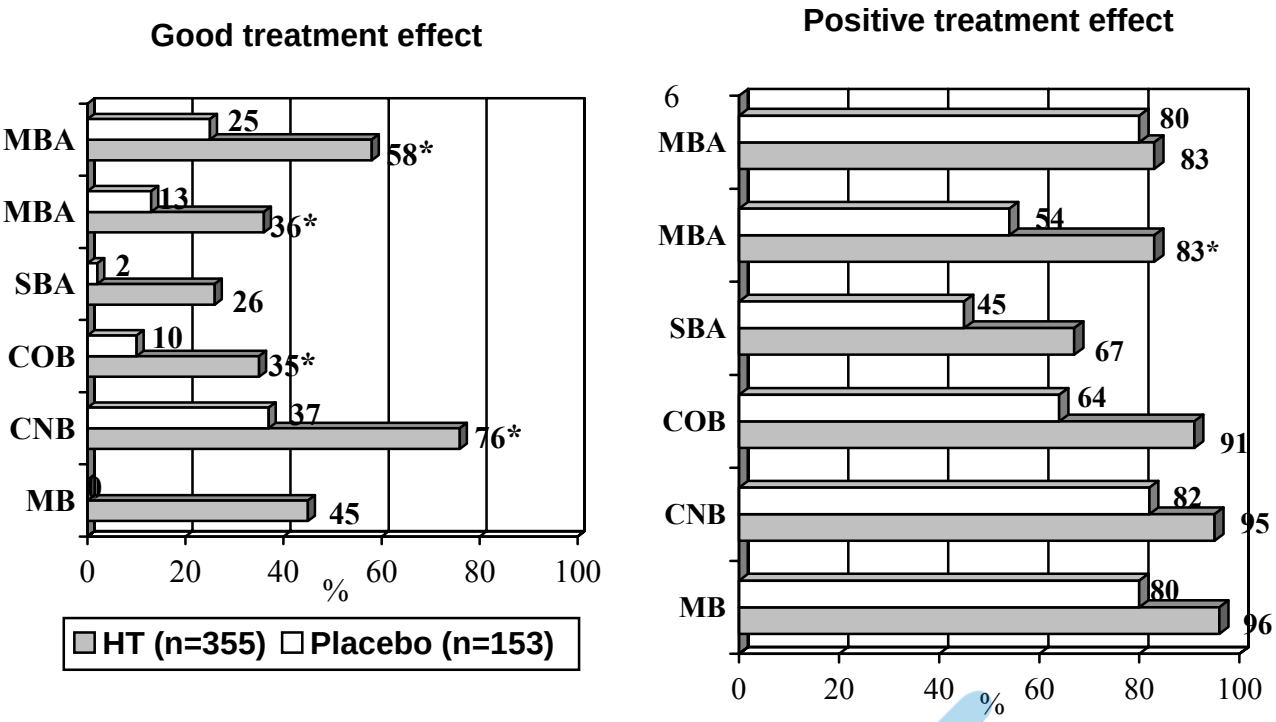


Fig. 1. Efficiency of halotherapy in patients with chronic obstruction lung diseases.

Note: MBA – mild bronchial asthma, MBA – moderate bronchial asthma, SBA - evere bronchial asthma, COB – chronic obstructive bronchitis, CNB – chronic nonobstructive bronchitis, MB – multiple bronchiectasis.

5.7±1.1 months and upon taking ГАЭТ course it totaled 9.2± 1.2 months ($p < 0.05$); in COB patients it totaled 5.5±1.0 and 8.6±0.9 ($p < 0.05$) accordingly; in MB patients it totaled 3.8±0.93 and 6.7±1.1 ($p < 0.05$) accordingly.

Thus, when analyzing the long-term follow-up upon treatment it was revealed that HT application in complex treatment in COPD patients allowed prolonging the disease remission and reducing the range of baseline therapy, improving the systemic condition and emotional status of patients. Good result of HT was achieved in 85% patients with prolonged and recurrent forms of AB and residual pneumonia, which demonstrates symptomatolytic condition and normalization of functional parameters. The most part of patients (53%) with the diagnosed infectious agents upon taking HT as monotherapy demonstrated reduction of antibody level to pneumococcus and hemophilic bacillus that is evidence of pathogen elimination. In addition to the mild anti-inflammatory action this method takes stimulatory effect on local and general nocifensors suffered within exacerbation period, contributes to recovery of respiratory biocenosis.

HT was prescribed as an adjunct for the group of CF patients, which was compared with the control group taken only baseline therapy. Application of both HT and HIT resulted in elimination of clinical course monotonicity, contributed to cough reduction, easier sputum discharge and its better consistency, pyogenesis reduction, upward trend of bronchial patency function that is evidence of improvement of bronchial drainage and influence on respiratory infectious and inflammatory process. Regimen and duration of HT and HIT application was developed both in hospital environment and domiciliary, tolerance was positively confirmed. In order to prognosticate response to HIT the functions (spirography results and bronchial hyperreactivity level) were used. Form of disease, particularities of microorganisms in sputum had not any influence on efficiency.

In pediatrics HT is mostly applied for treatment and rehabilitation of BA children within postattack and interattack period (efficiency - 75-85%), high efficiency was achieved when treating children with recurrent bronchitis especially in obstruction cases. Prospects of HT therapeutic action allow reducing the antibacterial agent prescription to a considerable extent that contributes to prevention of dysbacterioses and hypersensitive reactions in children. Preventive courses for infirm children reduce risk of recurrent diseases and contribute to recovery acceleration [14].

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Halotherapy as a method of primary and secondary prevention of respiratory diseases

It is extremely expedient to apply HT for primary and secondary prevention of RD. Application of this method in rehabilitation complex in sanatoria-preventoria in COPD patients and persons exposed to risks (working under unfavorable conditions) enables to reduce the morbidity rate in RD group and dependent labor losses in 1.5-2 times, prevent basic exacerbation. Application of HT is effective in 82% patients with hay fever.

Application of preventive procedures for smokers and individuals exposed to exogenous risks enables restoring of mucociliary transport, eliminating initial obstruction, restoring pulmonary host defense.

It offers the challenge to apply HT especially with haloinhalator Haloneb (more simple and easy method) as primary preventive measure for people working under unfavorable production conditions.

Upon applying haloinhalations within a three-month period twice a week on preventive basis the morbidity rate of common colds both in patients with chronic nonspecific pulmonary diseases (CNPD) and in conditionally healthy but exposed to COPD development persons was reduced. In the group taken HIT, it was recorded that common cold cases were almost 4 times less and "symptom" days were 5.6 times less as compared with the control group. These data confirmed that both HT and HIT are effective as primary and secondary preventive measures of RD.

Results of halotherapy application at diseases associated with chronic nonspecific pulmonary diseases

When considering the close interrelation between upper and lower airways and significant influence of ENT-pathology in development and advance of CNPD we focused on research of HT application particularities with available concomitant pathology. Antiedematous, antibacterial and immunostimulative action of haloaerosol has a beneficial influence on upper respiratory mucosa with a number of pathologic conditions (allergic and vasomotor rhinitis, chronic rhinosinusopathy, adenoiditis, chronic pharyngitis and others). When applying HT as a method for nasal pathology medical treatment it allows to achieve positive results in 72% - 87% cases. Positive dynamics at chronic allergic and vasomotor rhinitis and rhinosinusopathy under the dry fine sodium chloride aerosol demonstrated rhinedema and perirhinal edema reduction, nasal resistance reduction measured with the whole-body plethysmography method in 2.1 times. Dry sodium chloride aerosol takes beneficial effect on pituitary membrane and paranasal sinuses in more than 60% patients with chronic sinusitis. In 90% patients with acute sinusites 2-3 procedures of HT prescribed upon primary puncturing have sanation action. At chronic pharyngitis the treatment positive effect manifested in improvement of mucosa state, disappearance of discomfort events in throat can be achieved approximately in a half of cases. In patients with chronic tonsillitis HT is effective in combination with sanation procedures [16].

Application of HT is successful for rehabilitation of patients with skin diseases (neurodermatitis disseminata, allergic dermatitis, eczema, psoriasis, streptoderma and others), especially in cases if associated with bronchopulmonary pathology. Positive results of HT were obtained in patients with atopic dermatitis. Treatment effect was more apparent in patients with exudative form of the disease within the remitting phase of acute inflammatory exudative implications or state stabilization. Good results of HT were achieved at pyococcus neurodermatitis complications as well as in cases of pyoderma manifestations as spontaneous pathology. Procedures in halochambers take a health-improvement cosmetic effect on skin integument especially at liability to inflammatory pathology.

Application of halotherapy in elderly age and in patients with concomitant cardiac pathology

The long-term application of HT demonstrated safety of this method with regard to development of side effects on cardiovascular system allowed applying such method in patients with COPD and concomitant cardiac pathology including the elder age groups. Application of HT in patients with BA and COB elder 60 years with concomitant cardiac pathology (coronary heart diseases- CHD), discirculatory encephalopathy allowed to achieve the positive clinical effect without any negative reactions [11, 12, 19]. It is expedient to apply the rehabilitation complexes including in addition to HT, exercise therapy, massage, balneotherapy, local procedures of magnetotherapy, ultrasound therapy, aeroionotherapy in such cohort of patients.

During the last years HT has been increasingly applied in sanatorium-and-spa treatment. Patients of different groups and generally with concomitant pathology are directed in such sanatoria. Scientific observations and clinical experience with regard to application of a controlled microclimate enabling to select the adequate mode of curative concentration of dry salt aerosol totally demonstrated the beneficial effect of HT on cardiovascular system state.

HT has been commenced to apply within a rehabilitation program of patients with cardiac pathology including the patients undergone the coronary artery bypass graft surgeries [2]. These observations revealed that addition of HT to the rehabilitation complex resulted in moderate reduction and stabilization of arterial blood pressure both directly upon procedure (on average by 15-20 mmhg) and upon treatment course. Clinical dynamics was especially apparent in patients with concomitant cardiorespiratory pathology at that it was observed in haemodynamic indices and respiratory system state (dyspnea reduction, fall and decrease of expiratory dyspnea episodes intensity, expectoration improvement) as well. In these patients the reduction of bronchodilatory therapy range considerably influenced the rhythm disturbance episode rate.

Thus, these researches revealed safety and efficiency of HT application in patients with cardiac pathology.

Application of halotherapy in rehabilitation treatment complex

HT can be successfully combined with other physiotherapeutic and drug-free methods. Efficiency of HT considerably increases if combined with drainage exercises, breast vacuum massage, exercise therapy [9, 10]. HT gives a good account in combination with magnetotherapy, laser therapy, ultrasound therapy, low-frequency electromagnetic field therapy [3, 5, 19]. It is very efficient to combine HT with normobaric hypoxitherapy [4, 8].

Multiway action of different drug-free and physiotherapeutic methods forms prerequisites for the holistic approach to prevention and rehabilitation treatment in patients with respiratory diseases. In the context of predominant action of physical factors and clinical particularities of bronchopulmonary diseases the complex rehabilitation programs including HT combined with other physical methods such as apparatus aromaphytotherapy, dosaged aeroionotherapy, different types of massage, exercise therapy, resistive breathing exercises, respiratory vibrotherapy and etc. have been developed

Treatment course is rated for 2-3 weeks with daily procedures of 1 to 2 hours, which are sequentially conducted (Fig. 2). Methods aimed to obstruction component reduction, optimization of respiration pattern, respiratory muscles exercises (different types of resistive exercises: PEP-mask, RID, transcutaneous diaphragmatic electrostimulation and others) precede the inhalation methods in view of their potentiating action. In accordance with indications it is expedient to combine physical inhalation factors with medical nebulizer therapy.

Thus, a large scope of research and accumulated experience of practical application are evidence of efficiency and top range for curative-rehabilitation and preventive application of HT in routine of various medical and preventive treatment facilities.

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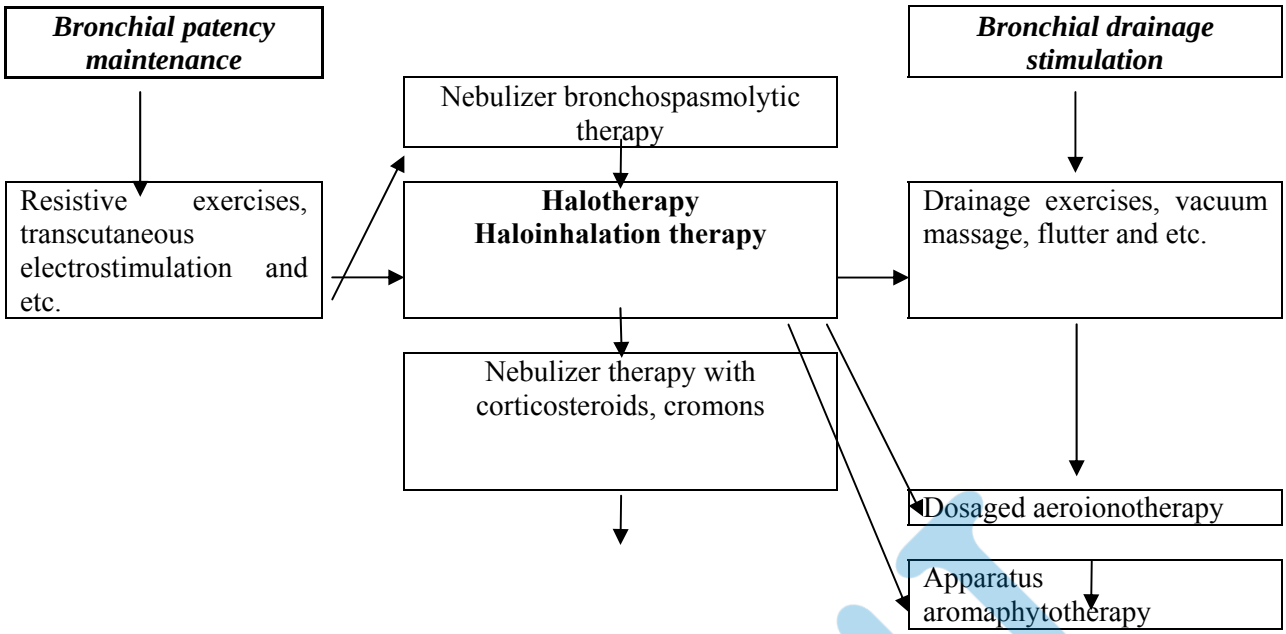


Fig. 2. Sequence of procedures of aerosol therapy complex.

References

1. Bobrov L.L., Ponomarenko G.N., Sereda V.P.//*Issues of balneology, physiotherapy and exercise therapy*, 2000, # 1: pp. 25-29.
2. Golukhova E.Z., Malyavin A.G., Klevtsov N.M. et al//Halotherapy and other modern medical technologies in recovery treatment and rehabilitation. *Sourcebook 7th Scientific-Practical Conference*. M, 2003: pp. 27-34.
3. Demko I.V., Puchko E.A., Pats A.I.//Pulmonology. *Appendix 5th National Congress on Respiratory Diseases, Theses book*, 1995, Thesis: pp. 559.
4. Kovaleva L.I., Zagoskina N.V., Gomzyakova I.T.//*Abstract book Seventh National Congress on Respiratory Diseases.* M, 1997: p. 218.
5. Konova O.M. Balabolkin I.I., Reutova V.S.//*V International Conference Modern Technologies of Rehabilitation Medicine*. Conference transactions. Russia, Sochi, 2002: pp. 452-454.
6. Konovalov S.I., Popov B.I., Turubarov K.V.//*Russian Aerosol Conference*: *Treatises book*. M, 1993: pp. 45-47.
7. Krasnoshtein A.E., Barannikov V.G., Shchekotov V.V. et al//*Issues of balneology, physiotherapy and exercise therapy*. 1999, # 3: pp. 25-28.
8. Larinckiy N.E., Vikulin S.V.//*Pulmonology. Sixth National Congress on Respiratory Diseases*: *Theses book*/Rev. A.G. Chuchalin. M, 1996: pp. 274.
9. Maev E.Z., Vinogradov N.V.//*Military Medical Journal*. 1999, # 6: pp. 34-37.
10. Nechay I.V., Apultsina I.D., Chervinskaya A.V.//*Pulmonology*. 1995, # 3: pp. 57-60.
11. Sviridov A.A., Zadionchenko V.S., Shmelev E.I. et al//*Pulmonology*. *Appendix 5th National Congress on Respiratory Diseases*/Rev. A.G. Chuchalin. M, 1995, Thesis 599.
12. Semochkina E.N., Silvestrov V.P., Surovikov V.N.//*Kremlevskaya medicina. Klinichesky Vestnik*. 1999, # 3: pp. 12-15.
13. Torokhtin M.D., Chonka Y.V., Lemko I.S. Speleotherapy of respiratory diseases under conditions of salt mines microclimate. Uzhgorod, Publishing House Transcarpathia, 1998: pp. 287.
14. Khan M.A.//Halotherapy and other modern medical technologies in recovery treatment and rehabilitation. *Sourcebook 7th Scientific-Practical Conference*. M, 2003: pp. 23-26.
15. Chervinskaya A.M. Haloaerosol therapy in complex treatment and respiratory disease prevention: Abstract, dissertation, Doctor of Medical Science. SPb, 2001: pp. 41.
16. Chervinskaya A.V., Aleksandrov A.N., Sereda V.P.//Inhalation therapy /G.N. Ponomarenko, A.V. Chervinskaya, S.I. Konovalov. SPb, SLP, 1998: pp. 209-226.
17. Chervinskaya A.V., Kvetnaya A.S., Chernyaev A.L. et al//*Therapeutist, archives* 2002. v. 74, # 3: pp. 48-52.

Chervinskaya A.V. Halotherapy of Respiratory Diseases // Physiotherapy, balneology and rehabilitation. - 2003, N 6. – P. 8-15 (Rus).

18. Chervinskaya A.V., Konovalov S.I., Strashnova O.V. et al. Application of medical technology of halotherapy in complex treatment and rehabilitation of respiratory diseases: *Guidelines*, M, 1995: pp. 18.
19. Sheina A.N., Lizunova N.I., Kasimtseva E.V. et al//*Kremlevskaya medicina. Klinichesky Vestnik*. 1999, # 3: pp. 20-21.

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ABSTRACT

In the scientific review the method of halotherapy simulating the parameters of salt spelaean clinic microclimate is described. The data with regard to the development of method, principles and advantages of halotherapy with a controlled microclimate of halochambers and haloinhalation therapy with portable haloinhalator are presented. Operative factors, pathophysiological foundations of curative action of this method, particularities of symptom dynamics within the treatment course and factors of clinical pattern change with different pathologies are analyzed. Data of clinical efficiency and substantiation of method application for rehabilitation treatment in patients with bronchopulmonary pathology as a method of primary and secondary prevention of respiratory diseases for ENT and skin diseases as well as in persons with concomitant cardiac pathology were presented.

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