EFFECT OF PSAMMOTHERAPY ON CARDIOVASCULAR SYSTEM OF PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN STAGE OF REHABILITATION

Treatement of patients with chronic obstructive pulmonary disease (COPD) showed that a more expressed effect was observed in 93.9% patients of main group that additively received psammotherapy (PT). These results came simultaneously with positive dynamics of clinical symptomatics and external respiration function (ERF). Positive dynamics from the side of central hemodynamics was also observed that manifested in reliable cardiac beats rate (CBR), normalization of systolic arterial pressure (SAP) and diastolic arterial pressure (DAP), increase of blood minute volume (BMV), blood beat volume (BBV), heartbeat index (HI), decrease of common peripheral vascular resistance (CPVR). Transition of hypokinetic type of hemodynamics into euukinetic one was often observed.

In general, procedures of psammotherapy contributed to increasing efficacy of medicament basic therapy (by 58.5 %) and decreasing medicament loading in 63.0% of patients. Inhaled corticosteroids were cancelled in 51 (45.5%) patients in process of psammotherapy, in 21 (18.8%) of patients were reduced their dosage. It should be concluded that psammotherapy has mainly non-specific anti-inflammatory and broncho-dilatating effects accompanied by reliable reduction of exsudative inflammatory changes in bronchi and bronchiolae, increase of respiration motions, normalization of main indices of activity of inflammatory process.

Keywords: Psammotherapy, chronic obstructive pulmonary disease, central hemodynamics, external breathing function.

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Introduction

Epidemiologic and clinical studies of the last decade indicate the growing prevalence of chronic obstructive pulmonary disease (COPD) and its more severe course resulting an earlier invalidity and death of patients (Aysanov et al., 2001; Ubaydullaev, 2005). In COPD there are noted: updates in rheologic features of blood by a type of hyperviscosity syndrome leading to disorders of pulmonary and myocardial microcirculation; state of ventilation, hemodynamic and tissue hypoxia; formation of secondary arterial pulmonary hypertension that reinforces pressure on right section of the heart and, therefore, increases a need of myocardium in oxygen, restricts coronary fraction of cardiac output and aggravates myocardial ischemia of both ventricles that results in progression of cardio-pulmonary failure (Chuchalina, 2003).

Despite of a great number of therapeutic remedies used for treatment of COPD patients (non-steroid anti-inflammatory drugs - glucocorticosteroids, immunomodulators etc.), efficacy of therapy of the mentioned pathology is insufficient (Casaburi et al., 2002; Chodosh et al., 2001).

To increase the quality of treatment of COPD patients alongside with medicament therapy the non-medicament methods are used with applying of pre-formatted and natural physical factors, including heat therapy (thermotherapy) - paraffin applications, therapeutic ozokerit muds, etc. (Zunnunov, 2000). In this aspect psammotherapy (PT) being a treatment with hot sand of artificial or natural sunny heating represents a great interest. Treatment with hot sand of sunny heating has been used from ancient times. Information about sand baths was cited in works of Herodotus, Galen, Avicenna (Zunnunov Z.R., 2000).
It is known that sand baths are used after heating of sand with sunny rays or by means of special apparatus on sea, riverbanks, lake coasts, in sanatoria, health resorts as well in special appropriate areas. Studies of Volsky (1962) show that baths from the artificially heating lake sand have curative effect in treating rheumatism, diseases of peripheral nerves, joints, inflammatory diseases of genital organs, they reduce arterial pressure. But in the literature of the last decade we have not found information about efficacy of the flying barchan (sand-dune) sands of natural sunny heating that are being used in the East during thousand years with medicinal purpose in different diseases.

Aim of study was investigate an effect of psammotherapy (PT) on cardio-respiratory system of patients with chronic obstructive pulmonary diseases in a stage of rehabilitation.

Materials and methods

Already in the 90s of the last century (after organization of the clinic of the Termez branch of the Research Institute of Therapy and Medical Rehabilitation) the psammotherapy studies on the steppe barchan sand origin “Etim-Kum” were begun, where a proper ground for sand baths was established (Zunnunov et al., 2006). This place is characterized by a presence of fine-grained, dark-yellow sand containing of sandy, clay and quartz particles of feldspar with inclusion of fine quartz grains. In this region, population used during hundred years sands for treatment of joint diseases, consequences of trauma, barrenness, etc. (Nurov et al., 2007). This sand was brought into clinic where a special pavilion for psammotherapy was built.

Chemical analysis of the given sand has been carried out, its particles were presented with minerals, containing of calcium, potassium and particles of sodium aluminium mica (KR\textsubscript{2-3}, (OH\textsubscript{3})\textsubscript{2}, AlSiO\textsubscript{3}, where \textit{R} = H, Mg, Fe), quartz (Si) and some other elements. The microbiology analysis revealed that sanitary-bacteriologic indices corresponded to standard ones accepted.

Clinical physiological investigations were performed in 134 COPD patients in a stage of an incomplete remission (82 men and 52 women; mean age - from 30 to 65). All the patients were divided into two representative groups using open randomization. Main group formed 108 patients (68 men and 40 women) that received psammotherapy in combination with a standard basic therapy (B\textsubscript{2}H\textsubscript{2} agonists, inhaled corticosteroids etc.). Control group formed 26 patients (14 men and 12 women) received standard basic therapy without psammotherapy.

Evaluation of efficacy of treatment was conducted through clinical examination of external respiration function (ERF) and central hemodynamics (CH). ERF was investigated by using of computer spiro scop of a firm “OLIVETTI” (Korea). Main indices of ERF were analyzed: vital pulmonary capacity (VPC%); forced VPC (FVPC%); volume of forced exhalation in the first second (VFE,%); pick volume velocity (PVV%); VFE/VPC-index of Tiffno; maximum volume exhalation velocity on a level of great, mean and small bronchi (MVV\textsubscript{25}, MVV\textsubscript{50}, MVV\textsubscript{75} % respectively); mean volume exhalation velocity (VEV\textsubscript{25-75}) in interval 25-75 VPC.

Central hemodynamics was studied by means of echocardiography. Blood beat volume (BBV); blood minute volume (BMV); heartbeat index (HI); cardiac beats rate (CBR); systolic arterial pressure (SAP); diastolic arterial pressure (DAP); common peripheral vascular resistance (CPVR) were calculated.

Examination of patients was performed before and after treatment course. Statistical treatment of results was made in “Statistica” program for “Windows -2000” and using of Student’s t-criterion.

PT was performed in a specially established pavilion by a method offered by Zunnunov (2000). In the earlier summer, June, where heating of sand in its depth was not incomplete, for procedures was used an upper thin layer of sand (0-5 cm). Area intended for psammotherapy was divided in the morning in fields and special holes “medallions” (size 2x1m) were being prepared. Round every medallion a wall with height 6-10 cm was built.

Patients come to procedure of psammotherapy 30 minutes before the beginning of procedure, during these minutes they rest in shade and adapt to thermic conditions of
environment. At the same time, medical staff performs examination of physiologic parameters of patients: their weight, oral temperature, arterial pressure, pulse, parameters of hemodynamics and external respiration.

Procedures of psammotherapy are being carried out at 14.00-15.00 p.m. Patient lies down into hole, his naked body parts are covered with sand taken from surface of hole up to 1-2 cm. After, the warmer sand from a wall or sand taken as a thin layer (2-5cm) from surface of area is put over. Extremities and trunk of patient (except heart area) are covered with a thin layer of sand (6-10 cm) taken from the ground; an upper part of abdomen, breast up to neck of patient are covered with bed-sheet. The shield for protection from sun is established over a head of patient, and if indicated a head is moistened with cool water.

In July and in the first decade of August a sand is warmed up to a depth 5-10cm and characterized by very high temperatures (up to 64-78°C). This sand layer up to depth 5-10 cm is taken and naked parts of patient’s body are covered with sand from the upper part of sand heap that provides prevention from burn and comfort during the whole procedure. To maintain high temperatures of sand during the whole procedure the upper sand layer should be replaced every 10 minutes with hot sand. Prolongation of a common sand bath is 15-30 minutes; a course contains 7-10 baths. Medical control of patient’s state is performed in every 5 minutes: arterial pressure, pulse, temperature is measured orally. After finishing a procedure a patient takes place under awning in protected from wind place where he rests 20-30 minutes and drinks green tea, then patient washes off sand in shower-bath and rests during 1.5-2 hours in a ward.

Results

No reliable differences in clinical and functional indices before the beginning of treatment between patients in main and control group were revealed (P > 0.05). ERF examination, before the beginning of a course of psammotherapy, revealed obstruction on a level of peripheral portions in 88 of 134 patients; obstruction on a level of central portions of bronchi was indicated in 46 patients.

ERF indices were low: VPC - 62.4±1.4%, VFE₁ - 48.9±2.3%, VFE₁/VPC - 56.4±2.4%, PVV - 43.89±6.3%, FVPC - 52.7±2.8%, MVV₂₅ - 28.33±2.4%, MVV₅₀ - 28.00±3.7%, MVV₇₅ - 32.00±4.8%, VEV₂₅-₇₅ - 37.4±2.9%.

After a course of treatment clinical indices and ERF system parameters have been improved in 60% of patients received basic therapy without psammotherapy. Indices of ERF were increased at a whole VPC - 69.3±4.13%, VFE₁ - 58.8±3.19%, PVV - 62.8±4.7%, VFE₁/VPC - 64.9±5.8%, FVPC - 59.3±4.9%, MVV₂₅ - 32.9±5.12%, MVV₅₀ - 36.4±4.6%, MVV₇₅ - 38.2±6.7%, VEV₂₅-₇₅ - 48.7±5.12%.

A more pronounced effect after treatment course was observed in 93.9% of main group patients which additionally received PT. In this group there were positive dynamics of clinical symptomatics and dynamics of ERF general parameters in COPDD patients; simultaneously the parameters of external breathing system were sufficiently improved. There were reliably increased parameters: VPC - 78.6±2.18%, VFE₁ - 71.8±1.10%, VFE₁/VPC - 76.8±4.75%, PVV - 67.6±3.4%, FVPC - 73.9±4.17%, MVV₂₅ - 38.6±6.08%, MVV₅₀ - 42.9±5.8%, MVV₇₅ - 46.6±3.4%, VEV₂₅-₇₅ - 62.1±2.6% and they were stable. All that evidenced the decrease or disappearance of obstructive disorders on all the levels of respiration pathways.

Investigations of central hemodynamics before therapy showed that CBR was 74.8±0.6 in a minute; SAP 130.3±2.3 mmHg; DAP 90.4±0.8 mm Hg.col.; BBV 50.4±2.4 ml; BMV 4.3±0.4 l/min; HI 40.2±2.4 ml/m²; CI 2.32±0.09 l/min/m²; CPVR 2592.7±7.1 din.s.cm⁻⁵. After treatment in both groups of patients the positive dynamics was observed, more pronounced in main group that manifested in reliable frequency of CBR, SAP and DAP normalization, increasing BMV, BBV, HI, decreasing SI and CPVR. More often a transition of hypokinetic type of hemodynamics into eukinetic one was observed. Thus, PT contributes to a marked adaptive correcting re-building of cardiovascular system, perfecting hemodynamics that leads to improvement of coronary and pulmonary blood stream.
Discussion

On the whole, psammotherapy procedures contributed to increasing efficacy of medicament basic therapy (by 58.5 %) and decreasing medicament loading in 63% patients. Inhaled corticosteroids were cancelled in 51 (45.5%) patients in process of psammotherapy; their doses were reduced in 21 (18.8%) patients.

By the end of treatment 53 (47.3%) patients receiving B2-agonists stopped their taking, other - reduced multiplicity and dosage of taking this preparation.

Thus, the carried out study demonstrated that clinical perfection in process of treatment was achieved in patients in both groups, but efficacy of treatment was higher in patients received psammotherapy.

When analyzed mechanisms of PT effect, it should be noted that thermal and mechanic factors during procedure contributed to mobilization of protecting adaptive mechanisms of organism. Under effect of heat in PT enlargement of peripheral vessels takes place, blood supply and transcapillary exchange improves, intertissual fluid easily turns into vascular channel that contributes to the further resolution of exsudates and reduction of bronchial edema and finally leads to decrease of obstructive syndrome.

Prolonged effect of heat in psammotherapy inhibits activity of central nervous system, weakens pain sensitiveness, i.e. has analgesic, sedative and soporific effect.

Is concluded that psammotherapy has preferable non-specific antiinflammatory and bronchodilatation effect that is accompanied by reliable decrease of exudative-inflammatory updates in bronchi and bronchiolae, an increase of respiration motions, normalization of main indices of inflammatory process activity.

Conclusions

1. A high efficacy of psammotherapy in basic treatment environment of COPD patients in a phase of incomplete remission was evidenced.
2. Psammotherapy not only improves clinical picture in COPD but also substantially perfects ERF and hemodynamic.
3. A wide application of psammotherapy in treatment of COPD in complex therapy in an incomplete remission and as monotherapy in a stage of remission is recommended.

References