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DOI: 10.22448/AMJ.2016.15-16.70-73

UDC 616.24-073.173

CIRCADIAN RHYTHMS OF THE RESPIRATORY SYSTEM IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE, DEPENDING ON THE SEVERITY OF THE DISEASE

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Abstract Organization of time of external respiration function in patients with chronic obstructive pulmonary disease was studied. According to the analysis of individual parameters of circadian rhythms of the respiratory function in patients with COPD it was found that in the process of increasing the severity of the disease weight of persons with daytime biorhythm was decreasing, and the number of patients with the eveningtime and then also with the morningtime biorhythm of the respiratory system were increasing as well.

Key words: chronic obstructive pulmonary disease, the circadian rhythms of breathing.

Chronic obstructive pulmonary disease (COPD), hypertension, coronary heart disease and diabetes constitute the leading group of chronic diseases – which accounts over 30% of all forms of human pathology, COPD is a global world public health problem. According to the data of various researchers, this disease affects from 4-6% to 10-25% of the adult population and it is characterized by the prevalence of sustained growth in both developed and developing countries [1, 2, 4, 5].

The aim of the work was to study the condition of the circadian rhythms of the respiratory system in COPD patients depending on the severity of the disease.

Materials and methods. Due to the tasks 104 COPD patients aged from 44 to 67 years with disease duration from 1 year to 10 years were selected. Depending on the severity of the disease, patients were divided into groups. Group I included 17 patients with mild disease severity. II Group of patients consisted of 29 patients with moderately severe COPD severity. Group III consisted of 29 patients with severe COPD. IV group included 11 patients with critical COPD severity. Control group included 15 healthy persons - 9 men and 6 women, whose average age was $53,1 \pm 2,76$, with no clinical signs of acute or chronic diseases of the respiratory tract and without any respiratory diseases in their history.

External respiration function was assessed using «Fucuda» spirometer (Japan) 4 times a day (at 06.00, 12.00, 18.00 and 24.00) for two days in a row. We analyzed the following parameters of respiratory function: vital capacity (VC), forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), the ratio of FEV₁ and FVC in percentage, the peak expiratory flow (PEF), the maximum expiratory flow at the level of 75%, 50% and 25% of forced vital capacity (MEF₇₅, MEF₅₀, MEF₂₅ respectively). All figures were calculated automatically according to the anthropological data, ambient temperature, were reflected on the screen and recorded by means of the printing device. During the evaluation of the main spirographic indicators (VC, FVC, FEV₁, FEV₁ / VC %) and indicators of the graph of the flow of forced expiratory (PEF MEF₂₅₋₇₅) the proper values were considered.

Statistical analysis was performed by means of kosinor analysis to estimate the parameters of circadian rhythms of biomedical parameters (F.Halberg, 1969), Statistica software v. 6.0. (StatSoft Inc., 1984-2001).

Minimum passability of the large bronchi was recorded at 6.00 and 18.00, medium size bronchi - at 6.00 and small - at 12.00. Acrophase of patency of large and medium bronchi observed during daytime hours, and small - in the evening.

Results and discussion. In 80% of healthy subjects the largest volumes of FEV₁, PEF recorded during the daytime, and the lowest - in the morning. VC, FVC were maximum in the daytime and minimum during the

night. Minimum passability of the large bronchi was recorded at 6.00 and 18.00, medium size bronchi - at 6.00 and small - at 12.00. Acrophase of patency of large and medium bronchi observed during daytime hours, and small - in the evening.

In 20% of healthy individuals acrophases of the most of spirometric parameters (FEV₁, VC, FVC, PEF, and MEF₂₅ MEF₅₀) were recorded in the evening.

Thus, in healthy subjects 2 types of biological rhythms of the respiratory system - the daytime and eveningtime were revealed. Daytime type was predominant. Synchronization of spirometric indicators wasn't observed.

In patients with mild COPD in 41.2% of cases, there was a daytime biorhythm type of the respiratory system with acrophases of spirometric rates from 12.00 to 18.00, in 35.3% - an eveningtime and 23.5% - a morningtime type of biorhythm with acrophase of the indicators of respiratory function in the morning hours. 11 (64.7%) patients had synchronization of all the spirometric indicators over time.

In the group of patients with moderate severity of the disease in 31.4% of cases daytime type was registered, in 45.7% - eveningtime, and in 22.9% of the cases - a morningtime type of biorhythm of respiratory system. Matching of all biorhythms types of spirometric indicators was observed in 69.0% of patients.

Patients with severe COPD were also characterized by three types of circadian rhythms of respiratory function: 22.9% - daytime type, in 40.0% of cases - an eveningtime and in 37.1% of cases - a morningtime type. Biorhythms types of the respiratory system matched in 86.2% of patients.

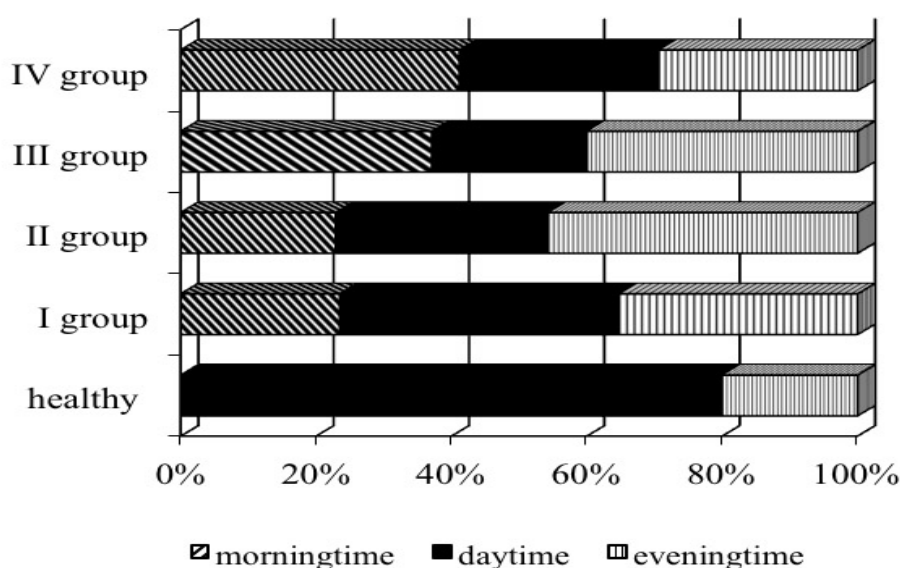
Fig. 8. Types of biorhythms of the respiratory system in patients with COPD and healthy people depending on the severity of the disease.

In patients with very severe COPD was recorded by 29.4% of the day and evening type and maximum number of patients with type morning biorhythm of the respiratory system - 41.2%. Synchronization of biorhythms of the respiratory system was observed in 90.9% of patients. In patients with critical severity of COPD there were recorded by 29.4% each of the daytime and eveningtime types and maximum number of patients was with the morningtime type of biorhythm of the respiratory system - 41.2%. Synchronization of biorhythms of the respiratory system was observed in 90.9% of patients.

Thus, in the analysis of individual parameters of circadian rhythms of respiratory function in patients with COPD three types of biorhythms of the respiratory system were identified - daytime, eveningtime and morningtime. Among the patients with mild and moderate disease severity was a slight difference in the number of patients with morningtime biorhythm type. With an increase of the severity of the disease, proportion of patients with this type of biorhythm was increasing: in severe - 1,6 times in comparison with mild severity and 1.7 times in critical severity of COPD.

In healthy individuals not mentioned synchronization spirometric performance during the day. With increasing severity of COPD was observed increase in the proportion of patients with coincidence of all the parameters of respiratory function. In healthy individuals synchronization of spirometric performance wasn't mentioned during the day. With an increase of severity of COPD increase of the proportion of patients with coincidence of all the parameters of respiratory function was observed as well.

Conclusions. During the COPD not only quantitative but also qualitative abnormalities of lung ventilation function occurs, which expressed in the pathological changes in the circadian rhythms of the respiratory system. Intensity of changes increases with the aggravation of the disease.



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DOI: 10.22448/AMJ.2016.15-16.72

UDC 617.731-007.23

THE RESULTS OF TREATMENT OF PRIMARY OPEN-ANGLE GLAUCOMA WITH THE USE OF ELECTRICAL STIMULATION

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Abstract. A comprehensive treatment of decompensated unstabilized open-angle glaucoma of early stages, including medication and physiotherapy. The study was conducted in 23 patients (34 eyes). Under the conjunctiva in the lower-outer quadrant the peptide neuroprotector cortexin of 10 mg (0.5 ml) is injected followed by electrostimulation. To evaluate the results of treatment used visometry, perimeter, and electrosensitivity and electrolability of optic nerve, tonometry are used. Comprehensive treatment of compensated unstabilized glaucoma improves visual function and stabilizes glaucomatous process.

Key words: open-angle glaucoma, electrostimulation, cortexin.

The main reasons for the progression of neuropathy in glaucoma with normal intraocular pressure (IOP) is a chronic ischemia and hypoxia associated with a deficit of hemodynamic and rheological blood disorders regional and systemic nature [2, 4, 5]. These processes lead to the loss of cell nutrients, accumulation of free radicals, activation of certain enzymes and accumulation of metabolic products [1, 3, 6].

Material and methods. We observed 23 patients (34 eyes) with compensated unstabilized primary open angle glaucoma early stages (including 12 men and 11 women, aged 52-74 years). Antihypertensive therapy received 19 patients, 4 patients had pseudonormal pressure.

All patients under the conjunctiva in the lower-outer segment was added a solution of 10 mg Cortexin 0.5 ml (10 injections), followed by electrical stimulation. For electrostimulation electrostimulator used ophthalmic ESOM microprocessor with the following parameters: pulse duration of 10 ms, the amplitude and frequency of the pulse selected individually, the number of pulses in a pack of 5, the interval between the packs 2 seconds, the number of packs in the series 30, the interval between the series 30 seconds, the number of series (applying the active electrode to each eye) 4. Pacemaker was placed on the eyelid alternately in the temporal and nasal area of the orbit, the patient's eyes were closed. The course of treatment was 10 procedures. All patients before treatment, after 10 days and 6 months after treatment were visometry, perimetry, biomicroscopy, gonioscopy, ophthalmoscopy, tonometry, an electrically sensitive (ECH), elektrolabilnost (EL) of the optic nerve.

Results and discussion. The average level of IOP before and after treatment was $22,3 \pm 0,69$ mm Hg. Art. Dynamic observation after 6 months marked decompensation IOP in 3 eyes, in the future it was recommended surgery.

Studies of visual function in patients with OAG demonstrates the effectiveness of our method.

Discussion of Data. Our investigations have shown visual acuity after the treatment increased in 96% of patients, and the average for the group changed to 0.12%, the boundaries of the peripheral field in the amount of 8 meridians increased in 98% of cases, an average of 14%. Indicator ECH patients decreased on average by 140 uA EL increased by an average of 9 Hz to 96% of cases.

Thus, the proposed complex treatment methods include electrical stimulation in combination with the drug Cortexin improves the stability of neural elements eyes to pathological factors causing the decline of visual function and improve visual function, ie, a therapeutically effective method of preserving visual function