(1985) to 1998,2±0,01‰ (2006). The TM level decrease was registered in 1999 (1315,4±0,01‰). The TM structure changes took place. In 2006 respiratory diseases ranked first - 28,0% (1985 – 27,0%), the apparatus system and connective tissue diseases ranked second - 26,2% (1985 - 16,5%) and the third place was taken by traumas, intoxications and some other after-effects of external causes action - 16,5% (1985 – 25,1%). Among the main reasons exerting influence on the coalminers' health state there are social-occupational factors and low medical activity. The effect of the given factors on the TM occurrence is proved statistically by the analysis-of-variance method (P<0,05). The research results suggest the necessity of coalminers' health status in-depth study and the development, based on the findings, of targeted preventive measures and rehabilitation program.

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TOTAL NON-ELASTIC RESISTANCE AND ALVEOLAR-CAPILLARY PERMEABILITY OF LUNGS AT COMMUNITY ACQUIRED PNEUMONIAS

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The investigation of clinical-physiological manifestations of community-acquired pneumonias (CAP) quite allows characterizing the patient's state and forming the functional component of the diagnosis (Chuchalin A.G. and co-authors, 2006). In particular, it is spread to the determination of the external respiration apparatus, which remains insufficiently studied at CAP up to the present time. So, the total non-elastic lung resistance (TNR) defined at the respiration biomechanics investigation at pneumonias was studied in single works (Tetenev F.F., 1981; Marshall R., Christie R., 1954). There are no works found out by us on the CAP TNR of lungs and its component – tissular rub – on lung zones and compared to the alveolar-capillary permeability of lungs.

The **purpose** of the work is to study and compared the lung TNR and alveolar-capillary permeability (ACP) in CAP patients in the acute period of the disease.

Materials and methods

35 patients suffering from the medium severity level CAP were examined, among them 21 patients with the focalization of pulmonary infiltration in the inferior lobe of the right lung and 14 patients with that in the inferior lobe of the left lung in the disease acuity (2-3 days of hospitalization); all the patients being aged from 16 to 55 years old. All the CAP patients and 30 healthy volunteers (I control group) were subject to the lung TNR investigation, the last being carried out in the phase of inspiration (TNRinsp) and expiration (TNRexp): integral and regional values. The integral TNR was measured by the method of transpulmonary pressure and spirogram simultaneous recording. The regional TNR values in the superior, central and inferior lobes of lungs were measured by means of the simultaneous recording of zonal ventilation rheograms by the method of Fringerman E.A. and transpulmonary pressure. The graphic recording of the curves and the computation of integral and regional TNR factors was performed by means of a special computer program. Also, the ventilating pulmonoscintigraphy was performed on all the CAP patients and 10 healthy volunteers (II control group). The nuclear medicine studies were carried out on the gamma camera "Omega 500" ("Technicare", USA-Germany). The image registration and processing was performed with the help of the computer system "Scinty" produced by the RDC "Gelmos" (Russia). As the radiopharmaceutical (RPC) for the ventilating pulmonoscintigraphy the DTPA was used. The polypositional static pulmonoscintigraphy was carried out after finishing the RPC inhalation in four standard projections, then repeatedly on the 10^{th} and 30^{th} min in the posterior-frontal projection. In the CAP patients and II control group the ACP was determined on the 10^{th} and 30^{th} min: primarily in the affected and intact lungs, then additionally in every lung on the 3 lobes (superior, central and inferior) – so called regional factors. As there were no authentic ACP differences between the right and left lungs and also the superior, central and inferior lobes found out in the control group, the general ACP values for the corresponding lung lobes were used. The findings got were subject to statistical processing with the help of the program STATISTICA-6, for Windows.

Results

The integral TNRexp values were higher in the CAP patients, than in the healthy persons (0,540±0,049 kPa·sec/l and 0,369±0,036 kPa·sec/l; p=0,003). As a result of the TNR regional values studies in the CAP patients it was found out that in the affection area the TNRexp increased with the infiltration presence in the inferior lobe of the right lung, and the TNRinsp and TNRexp increased, if the infiltration was focalized in the inferior lobe of the left lung. In the inferior lobe of the intact lung the TNR didn't change; in the central lobe of the right lung the TNRinsp and TNRexp were increased at any focalization of the pathologic process; in the superior lobe of the intact lung the TNRexp increased at the dextral CAP and the TNRinsp and TNRexp increased at the

sinistral CAP. The lung ACP integral values increase was found out on the 10th and 30th min of the investigation in the affected (22,1±3,4% and 36,6±2,4%; p=0,007 and 0,003) and intact (20,4±3,8% and 33,9±3,5%; p=0,003 and 0,006) lungs at the lung infiltration focalization in the inferior lobe of the right lung, and also in the affected (20,4±3,2% and 35,2±3,8%; p=0,005 and 0,002) and intact (7,4±2,4% and 32,4±2,4%; p=0,004 and 0,005) lungs at the lung infiltration focalization in the inferior lobe of the left lung. In the CAP patients (irrespective of the lung infiltration focalization) an ACP increase for radioaerosol was registered, first, ambilateral – both in the affected and in all intact lobes of both lungs, second, both on the 10th and 30th min of the investigation. Thus, at the CAP acuity a diffuse increase of the lung alveolar-capillary structures' permeability was found out.

Conclusions

The obtained results of the lung TNR and ACP regional values changes say apparently for an increased genuine mechanical lung activity in these lobes, due to the action of which a significant part of the lung TNR is worn down.

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PERVERSION OF REGIONAL RESPIRATORY LOOPS OF LUNGS IN HEALTHY PERSONS AND BRONCHOPULMONARY SYSTEM DISEASE PATIENTS

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Nowadays, lungs are considered as a passive elastic body, the respiratory movements of which are conditioned by the effect of forces on the part of the chest wall, respiratory musculation and diaphragm. In the process of respiratory movements the changes of transpulmonary pressure anticipate the changes of lung volume. The phase shifting between these processes is called hysteresis, it manifests itself in the form of a respiratory loop reflecting the amount of breathing work to wear the total non-elastic resistance of lungs down. However, a paradox was was found out, when the lung volume changed earlier, than the transpulmonary pressure did, that was called the respiratory loop perversion or negative hysteresis of lungs. According to the first law of thermodynamics such a phenomenon is only possible in the case of action of intrapulmonary source of mechanical energy performing the inspiratory and expiratory volume change besides the effect of the forces on the part of the thoracic cage and diaphragm. The paradoxic facts described referred to the integral pulmonary mechanics, whereas the regional pulmonary mechanics remained practically unexplored.

The **purpose** of the investigation is to study regional respiratory mechanics in healthy persons, community-acquired pneumonia (CAP) and chronic obstructive pulmonary disease (COPD) patients and find out, if the phenomenon of the respiratory loop perversion takes place on the regions of lungs.

Materials and methods

92 patients were examined, among them there were 30 male volunteers (aged 19,78±1,35), 31 patients with chronic obstructive pulmonary disease of I-II stage in the phase of fading acuity with the duration of the disease from 7 to 20 years, 19 men and 7 women (aged 43,93±3,03) and 31 – the community acquired patients in their acuity, 28 men and 3 women (aged 40,76±2,23). The regional respiratory mechanics factors were determined by means of simultaneous recording of zonal ventilation rheograms on six zones of lungs and transpulmonary pressure. The graphic recording of the curves and the computation of integral and regional TNR factors was performed by means of a special computer program. The graphic recording of the curves and the computation of regional factors of respiratory mechanics was performed by means of a special computer program.

Investigation results

There was found the respiratory loop perversion phenomenon, which is described for the first time ever. The perversion of the mechanical hysteresis of lungs is a fundamental contradiction in the paradigm of Donders. In our investigations of the regional respiratory loop perversions were registered in 15 healthy volunteers, in 9 CAP patients, in 7 patients with chronic obstructive pulmonary disease. The average values of negative regional hysteresis of lungs (non-elastic breathing work) in healthy persons made 1,692±0,266 Om·m/min, in CAP patients - 1,077±0,237 Om·m/min, at COPD - 0,672±0,211 Om·m/min. The presence of negative regional hysteresis in healthy persons testifies to significant functional possibilities of lungs and also to the fact that in normal conditions at spontaneous breathing a more or less participation of lungs in pulmonary mechanics is possible, that is manifested in lung mechanical properties discontinuity on regions. The negative regional hysteresis is a positive qualitative characteristic of the mechanical system of lungs. This supposition was based on the fact that the regional respiratory loops perversion was illustrative of healthy persons in a greater degree. Besides, the detectability of negative regional loops reduced with the increase of load on the external respiratory apparatus under the effect of pathological factors (regional respiratory loops perversions occurred 1,7 times as seldom in CAP pa-