

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 musculature 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 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 paradoxical 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-

tients, and twice as seldom in COPD patients, than in healthy persons). It, in its turn, said for the fact that as distinct from healthy persons a smoothing of lung mechanical characteristics on regions was registered in the CAP and COPD patients. Evidently, it was associated with the fact that at the pathology, when there is a disturbance of pulmonary mechanics and the load on the external respiration increased, the degree of separate regions' participation discontinuity in the pulmonary mechanics reduced, that was considered by us as the manifestation of lung regional homeostasis support mechanism action. The strain of the system supporting mechanical homeostasis resulted in leveling of lung mechanical characteristics on regions,

their mechanical discontinuity reduced and the perversions of regional respiratory loops were found out more seldom.

Conclusions

While studying regional pulmonary mechanics the phenomenon of regional respiratory loop perversion was found out in healthy persons in 50% of the cases, in CAP patients – in 29% of the cases, in COPD patients – in 23,8% of the cases.

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