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Influence of the "Free-Radical-Antiradical Activity" System on the Level of Bronchial Obstruction in Patients with Chronic Obstructive Bronchitis, Complicated with Chronic Pulmonary Insufficiency

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Abstract

Have been stated, that parameters of free radicals and a degree of imbalance in system - "free radicals - antiradical activity" statistically correlates with chronic obstructive bronchitis and chronic lung insufficiency.

Keywords: *COPD, hypoxia, free radicals, pulmonary insufficiency, spirometry*

Lungs themselves represent the biggest biological membrane, the outer surface of which is in constant contact with oxygen and another active initiators of free radicals' (FR) generators (O_3, NO_2). The aerohematic barrier of which mostly is provided by the structural organization of phospholipids and lipoproteins. According to the most available data, it is clear that activation of FR generation is associated with diminution of cholinergic activity of lungs, which itself causes damage of bronchial passage [1]. The FR - induced damage of lungs is characterized not only by ventilation disorders, but also with increase of concentration of biologically active mediators, which results in infiltration of tissue with inflammatory cells, increase in vascular permeability, tissue swelling, local hypoxia, disorders of oxygen diffusion and hypoxemia [2].

According to the data of numerous investigators, the antioxidant system of lungs provides not only protection from FR - damaging action, but also influences numerous adaptational reactions. Disorders of anti-oxidant system themselves represent the pathogenic factors for COPD [3].

Broncho-pulmonary system possesses several protective barriers. The primary barrier is represented by tracheo-bronchial mucous. About 80% of its mass is formed by glicoproteids, which are able to split hydrogen peroxide, but glucose, fructosa, galactosa, mannitol and sialic acids are causing inactivation of hydroxilic radicals. During this process the sugars and glicoproteids are fragmented, which is associated with changes in gel-producing and viscosity properties of mucous. During massive and prolonged influence of hydroxilic radicals, when the anti-radical activity of mucous is exhausted the final products of FR are accumulated. When mucocilliary clearance and process of mucous production are normal, the renovation of mucous membrane is timely and FR is not accumulated. So it is possible, that insufficiency of antiradical protection is one of the mechanisms of disorder of mucocilliary system and mucous production in patients with COPD. The functional insufficiency of anti-oxidant system may cause development of broncho-pulmonary disease via activation of FR - induced damages [4]. Disbalance of the "free radical - anti-radical activity" system (FR-ARA) is an important pathogenic mechanism in development of COPD [5].

The aim of this study was an investigation of parameters of "FR-ARA" and spirometry in patients with chronic obstructive bronchitis (COB), demonstrating different levels of chronic lung insufficiency (CLI), in order to determine influence of "FR-ARA" system on bronchial obstruction.

Thirty six patients with COB, demonstrating I-II-III levels of CLI and 12 healthy adults were investigated.

"FR-ARA" system was evaluated by the method of luminol-dependent chemiluminescence (CHL) (J. Linden; 1987) using ΠXL apparatus for determination of generation of active forms of oxygen. Activity of superoxiddismutase (SOD) was investigated by the method of M. Nashikimi (1972), and catalase - by the titration method (1988). In the similar manner the activity of glutationeperoxidase (GP) and glutationreductase (GR) were determined. The level of disbalance of "FR-ARA" system was calculated by the index of CHI/SOD. Spirometic values were determined by pneumotachograph PTG-3 (Russia) and spirograf "Godart" (Netherlands). In the *Tab.1* together with values of blood oxygen partial pressure (PaO_2) we have listed only those spirometric date, which are characterizing bronchial obstruction and its level (FEV_1, FEV_1/FVC, V_{max}, V_{25}, V_{50}, V_{75}).

According to the data, represented in *Tab.1*, together with increase of level of CLI the changes in "FR-ARA" system are observed, which are represented in increase of FR. This is expressed in statistically reliable increase of CHI value together with concordant increase of level of CLI. In patients with I level of CLI was revealed statistically reliable increase in CR and catalase activity. In the similar manner are increased GP values ($p<0.05$) and SOD values are decreased ($p<0.05$). In patients with II-III level of CLI all values of anti-radical activity are statistically significantly reduced as compared with the analogous data of patients with I level of CLI, which is indicating reduction of anti-radical activity. According to the changes of CL/SOD values the level of disbalance of "FR-ARA" system was proposed and this latter one was significantly increased together with lung insufficiency expression as compared with healthy controls. The data of bronchial obstruction (FEV_1, FEV_1/FVC, V_{max}, V_{25}, V_{50}, V_{75}) were significantly decreased together with elevation of level of CLI in patients with COB.

According to the data obtained, we can conclude, that FR indicators and level of disbalance in "FR-ARA" system statistically reliably correlates with expression of bronchial obstruction in patients with chronic obstructive bronchitis, complicated with chronic lung insufficiency.

Values	Normal n=12, M±m	I level CLI n=12, M±m	II level CLI n=12, M±m	III level CLI n=12, M±m
Catalase x10 E/mg Hb	3.55± 0.38	5.99±0.28*	3.61±0.29**	3.07±0.35***
GR x10, E/mg Hb	5.59±0.41	8.35±0.39*	3.15±0.31**	2.69±0.37***
GP x10 E/mg Hb	10.58±0.65	11.37±0.25*	7.14±0.30**	6.25±0.41***
SOD, E/mg Hb	117.45±3.95	95.73±1.87*	53.77±1.93**	38.95±1.92***
CHL,	47.49±1.48	64.51±0.98*	69.45±1.42**	92.99±2.80***
CHL/SOD	0.41±0.01	0.67±0.02*	1.29±0.05**	2.38±0.04***
FEV_1		80.0±3.1*	49.2±3.8**	28.5±2.9***
FEV_1/FVC	82.5±2.1	71.5±1.8*	62.9±2.8**	40.5±3.0***
Vmax	89.0±4.9	68.4±5.5*	41.6±4.5**	21.9±2.5***
V_{25},%	85.5±4.3	73.0±4.5*	37.4±3.2**	14.8±2.5***
V_{50},%	89.7±5.8	75.2±5.5*	39.7±4.5**	16.1±15***
V_{75},%	84.2±4.5	69.1±5.8*	41.0±4.5**	16.1±1.7***
PaO_2 mm Hg	86.3±1.3	75.0±0.8*	65.2±1.0**	56.7±1.2***

Tab.1 *The dynamics of values of bronchial obstruction and "FR-ARA" system in COB patients with different levels of CLI.*

*statistically reliable change in patients with I level of CLI as compared with normal values.
**statistically reliable change in patients with II level of CLI as compared with patients with I level of CLI
*** statistically reliable change in patients with III level of CLI as compared with patients with II level of CLI

References

1. .J. Jaskson, D.A. Jones, F.J. Harris. Inhibition of lipid peroxidation in muscle hemogenates by phospholipase A2 inhibitors // Bioesci Repts. 1984, V.4, N7, P. 581-5.

2. M.C. Prevost, C. Cariven, M.F. Simon et al. Platelet-activating factor (PAF-acether) is released into rat pulmonary alceolar fluid as a consequence of hiloxia - Biochem. Biophys.res.commun. 1984, V.119, N1, P. 58-63.

3. N.V. Syromiatnikova, V.A. Goncharova, T.V. Kotenko. "System of oxydation of lipids-atioxidants" in "Metabolic activity of lungs", Leningrad, "Medicine", 1987. P. 95-115. [Russian]

4. I.V. Chesnokova, A.V. Nikitin, "Condition of system oxydation lipids - antioxidants in patients with chronic bronchitis. II Congress of diseases of respiratory system. Chelyabink, 1991, P.69. [Russian]

5. G.G. Kalandarishvili, "Non-medicamentous treatment of chronic insufficiency of lungs", Doct. degree dissert, Tbilisi, 1999. [Georgian]

Влияние системы "свободные радикалы-антирадикальная активность" на степень бронхиальной обструкции у больных с хронической легочной недостаточностью

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Р Е З Ю М Е

Показатели свободных радикалов и существующая степень дисбаланса в системе "свободные радикалы-антирадикальная активность" статистически достоверно коррелируют со степенью выраженности бронхиальной обструкции у больных с хроническим обструктивным бронхитом , хронической лёгочной недостаточностью.

Ключевые слова: *ХОБЛ, гипоксия, свободные радикалы, лёгочная недостаточность, спирометрия*