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CHANGES IN LIPID METABOLIC INDICES DURING THE SECOND-LINE ANTITUBERCULAR THERAPY

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Abstract*. Present study was performed to evaluate the changes of lipid metabolism in multidrug-resistant pulmonary tuberculosis patients during the treatment with second-line antitubercular drugs. Our study involved 36 MDR-TB patients. Control group comprised 20 healthy individuals who had not been previously diagnosed or received antituberculosis medication. According to our results, second-line antituberculosis drugs have negative effect on lipid metabolism of multidrug-resistant patients in the form of worsening of dyslipidemia manifestations. In choosing further treatment tactics, it is advisable to use virtual and three-dimensional models of the lung area, built according to the spiral computed tomography data, to illustrate the picture of the pathological changes taking place.*
Keywords: *Multidrug-resistant tuberculosis, lipid profile, total cholesterol, treatment, atherogenic index.*

Introduction. Cholesterol plays one of the key role in human immune defense against infection agents [1,2]. Hypocholesterolemia is frequent pathological condition that observed in patients suffering from tuberculosis (TB). It can be considered as one of the risk-factors leading to the development of the disease. But it also cannot be excluded as a consequence of the severe tuberculosis intoxication. It is known that antituberculosis treatment raises total cholesterol level and promotes restoring of high density lipoprotein cholesterol in patients with drug-susceptible pulmonary tuberculosis [3]. But there is no data about changes of lipid profile indices during the treatment of patients with multidrug-resistant tuberculosis (MDR-TB) of the lungs.

The aim. Present study was performed to evaluate the changes of lipid metabolism in multidrug-resistant pulmonary tuberculosis patients during the treatment with second-line antitubercular drugs.

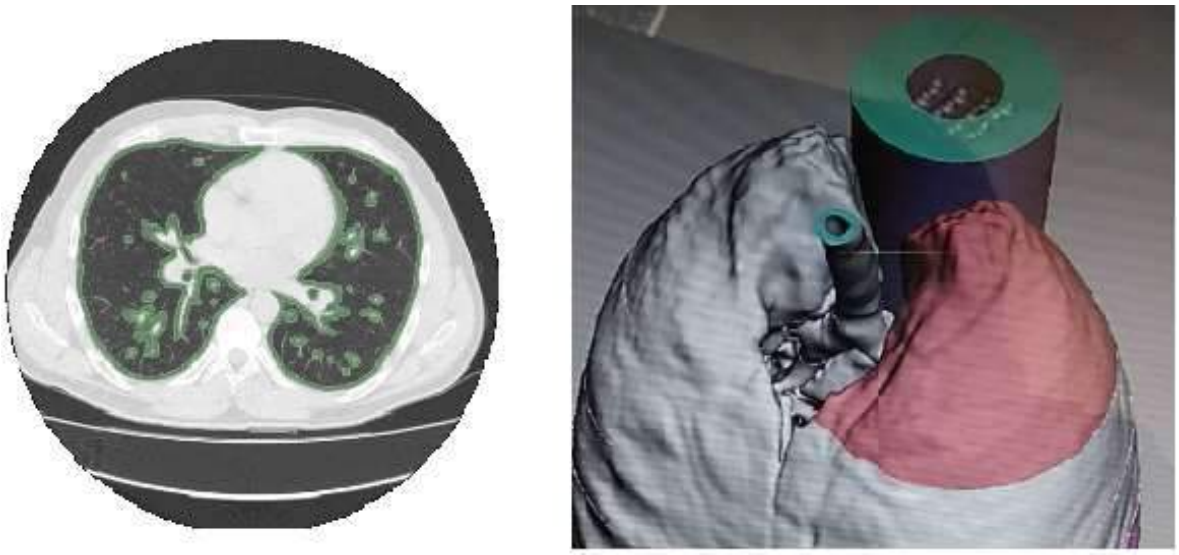
Materials and methods. Our study involved 36 MDR-TB patients. Control group comprised 20 healthy individuals who had not been previously diagnosed or received antituberculosis medication. Patients who had extrapulmonary TB, HIV/TB co-infection, TB/DM comorbidity, pregnant women, children and elderly persons were excluded from the study. Blood specimens were collected after 10 hour overnight fast. Serum levels of total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) and triglycerides (TG) were measured before the beginning of the treatment and after 30 days of therapy by second-line antitubercular drugs. We also calculated atherogenic indices in order to determine whether TB treatment affects these predictors of disease associated with dyslipidemia in MDR-TB patients. Statistical processing of the obtained results was carried out by analyzing the contingency tables using the StatisticaBasicAcademic 13 for Windows software package. We used the median (Me) interquartile range (Lower - lower quartile, Upper - upper quartile) and sample size (min - minimum, max - maximum value).

Results. MDR-TB patients were aged between 19 and 50 years with an average age of 35.27 ± 11.29 and included 29 men (80.55%) and 26 women (19.44%). The control group consisted of 15 men (75.00%) and 5 women (25.00%). The age of the control group was between 20 and 49 years with an average of 34.70 ± 10.38. There were no significant differences in age ($p=0.063$) between the two groups.

We found significantly lower median levels ($p<0.005$) of TC (4.2 mmol/l vs 5.3 mmol/l), HDL-C (1.07 mmol/l vs 1.48 mmol/l) and LDL-C (2.83 mmol/l vs 2.5 mmol/l) in MDR-TB patients as compared to control group before treatment, that is similar to results received by other scientists when comparing lipid profile of drug-susceptible TB patients and healthy persons. The median of atherogenic index before treatment was significantly higher ($p<0.005$) in MDR-TB patients compared to normal subjects (3.15 vs 2.6) which indicates to the presence of dyslipidemia in MDR-TB patients. During the 30 days of antitubercular therapy, the median level of TC increased significantly ($p<0.01$) from 4.2 mmol/l to 4.82 mmol/l. But we didn't get an increase in median HDL-C levels, as it was

revealed by other scientists who discovered the influence of first-line antituberculosis drugs on the lipid metabolism of pulmonary TB patients. On the contrary, during the medication with second-line antitubercular drugs, the level of HDL-C became lower, than it was previous to treatment (1.07 mmol/l vs 0.94 mmol/l). We also found significant increase ($p<0.01$) in LDL-C levels after 30 days of treatment with second-line antitubercular drugs (2.83 mmol/l vs 3.2 mmol/l) while, according to scientists, first-line antitubercular drugs did not lead to an increase in LDL-C levels in patients with drug-susceptible pulmonary TB [3]. Triglycerides levels were almost unchanged, though the median level decreased slightly from 1.4 mmol/l before treatment to 1.35 mmol/l after 30 days of therapy. Statistically significant increase in atherogenic index of MDR-TB patients was observed during the 30 days of antitubercular therapy (3.14 vs 3.95). We also found the reduction of total protein in MDR-TB patients during the treatment (75.2 vs 73.4) that probably indicates that the administration of second-line antitubercular drugs has caused an impairment of liver function. The selection of significant indicators significantly improves the sensitivity and specificity of diagnostic studies [4 - 6].

Also, when planning further treatment, it is advisable to conduct a virtual simulation of the pathological state of the lungs according to spiral computed tomography [7, 8]. At the same time, according to the dataset [9, 10] data set, consisting of axial tomographic slices (see Fig. 1, a) [11], volumetric lung reconstructions are constructed (see Fig. 1, b). This allows the specialist to visually see the spatial picture of pathological changes in the lungs, which can be used to plan further treatment tactics [12, 13], and can also be used for subsequent full-scale modeling with the creation of models using rapid prototyping [14-16].



a) *b)*

Fig. 1. Visualization of the lungs according to spiral computed tomography: a) axial section, b) volumetric reconstruction

Conclusions According to our results, second-line antituberculosis drugs have negative effect on lipid metabolism of multidrug-resistant patients in the form of worsening of dyslipidemia manifestations. In choosing further treatment tactics, it is advisable to use virtual and three-dimensional models of the lung area, built according to the spiral computed tomography data, to illustrate the picture of the pathological changes taking place.

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