

Streszczenie w języku angielskim

Introduction

Tick-borne diseases are a significant problem from the epidemiological and clinical point of view. Ticks are vectors of many viruses, bacteria and protozoa pathogenic to humans. In addition, they can carry more than one pathogen at a time, which can lead to co-infections in patients. The most common tick-borne diseases are Lyme disease (LD), tick-borne encephalitis (TBE) and human granulocytic anaplasmosis (HGA). Diagnosis of tick-borne diseases is sometimes difficult due to the occurrence of non-specific symptoms, and the occurrence of co-infections is an important clinical issue due to the impact of co-infection on the clinical course, diagnostic process and treatment. In the course of tick-borne diseases, the immune system is dysregulated and the oxidation-reduction balance is disturbed, which leads to oxidative stress, accompanied by oxidative modifications of the main cellular components, in particular polyunsaturated fatty acids. Their main reservoirs in the human body are phospholipids, which are precursors of lipid mediators and signaling molecules. It is assumed that metabolites formed under the influence of oxidative stress can potentially be used as biomarkers for differential diagnosis, monitoring the course of the disease and the effects of treatment.

Aim

The aim of the study was to compare changes in the profile of phospholipids and ceramides as well as metabolic pathways of linoleic, arachidonic and docosahexaenoic acids in the plasma of TBE patients and patients with bacterial co-infections (*B. burgdorferi* or *A. phagocytophilum*) and the control group.

Material and methods

The material for the study was plasma obtained from the blood of 16 patients with tick-borne encephalitis and 6 patients with TBE co-infection with other tick-borne pathogens: *B. burgdorferi* or *A. phagocytophilum*. The control group consisted of 8 healthy people.

Gas chromatography and liquid chromatography with tandem mass spectrometry were used for the determinations, and uni- and multivariate statistics were used for the statistical analysis of the results.

Results

Seven different classes of phospholipids were identified in the analyzed samples. They were: phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylinositol (PI), phosphatidylserine (PS), lysophosphatidylethanolamine (LPE), lysophosphatidylcholine (LPC) and sphingomyelin (SM). The results of the study showed that PC and LPC concentrations were elevated in the plasma of TBE patients and patients with TBE and co-infections. On the other hand, the observed differences in the content of PE and SM allow to distinguish patients with TBE from patients with co-infections. The obtained results also showed that changes in the SM content observed in the plasma of patients induced changes in the relative content of ceramides. Univariate analysis of the data set of ceramide types showed opposite changes in their relative plasma concentrations in two groups of patients (TBE and TBE + LD/HGA) compared to healthy subjects. The study also showed significant modifications in the metabolic pathways of linoleic and arachidonic acids.

Conclusions

The consequence of oxidative stress caused by tick-borne diseases are oxidative changes in the structure and functions of phospholipids and their metabolites, which affects cellular and systemic metabolism. The obtained results make it possible to distinguish TBE from TBE with bacterial co-infection, and consequently may improve the diagnostic process and potentially enable more effective pharmacotherapy.