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Metabolomics 2017, 7:2(Suppl)
http://dx.doi.org/10.4172/2153-0769-C1-038

Metabolic fingerprinting in patients with acute pulmonary embolism

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Introduction: Pulmonary embolism (PE) is a major cause of mortality, morbidity and hospitalization in Europe. In 30-40% cases of the PE, the cause (idiopathic or unprovoked PE) cannot be determined. Nowadays, metabolomics becomes important part of clinical studies. It can help to understand the disease process and propose diagnostic and prognostic biomarkers. Until now, there was no study using untargeted metabolomics in population of acute PE patients.

Purpose: Application of metabolomics to evaluate prognosis factors and identify novel diagnostic and prognostic markers for PE, which can bring new insight into disease pathophysiology.

Methods: Prospective analysis of plasma samples collected from 42 patients hospitalized in Cardiology Department (proven acute PE, treated with low molecular weight heparin (LMWH) and 13 healthy controls treated with adequate dose of LMWH was performed. Samples were fingerprinted with LC-QTOF-MS. Differences between patients' subgroups (all PE patients, control after drug (CAD) and sub-groups of idiopathic PE patients with and without deep vein thrombosis (DVT)) and controls were evaluated. Depending on data distribution t-test or Mann-Whitney test were used.

Results: Performed metabolomics analysis resulted in detection of more than 200 significantly altered metabolites. Multivariate statistics confirmed clear separation between the examined groups. Venn diagrams allow selecting common and differentiating compounds for particular comparison. Significant changes were observed in level of cholesterol derivatives, acylcarnitines, phospholipids, fatty acid (like arachidonic acid) and their amides.

Conclusions: Metabolic fingerprinting could be helpful to improve diagnosis and to understand pathophysiological mechanisms related to acute PE. The metabolites significantly different in acute PE patients were associated with hypoxia, lipid-related energy imbalance, alterations in mitochondrial function and signal transduction pathways. Moreover, some of detected compounds were linked with cardiovascular diseases.

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