

GW23-e1377

PLASMA METABOLOMICS REVEALS NOVEL METABOLIC MARKERS OF CHRONIC HEART FAILURE

doi:10.1136/heartjnl-2012-302920.4

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Objectives Chronic heart failure (CHF) is a progressive clinical syndrome characterised by inability of the heart to adequately pump blood to meet metabolic demands of the body. There is intense interest in the identification of novel biomarkers which could improve the diagnosis of chronic heart failure. The overarching goal of the work discussed here was to apply a high-throughput approach, using ¹H-NMR spectroscopy to identify novel plasma biomarkers and metabolic signatures underlying chronic heart failure.

Methods Plasma samples from 30 patients with systolic heart failure (EF<40% plus signs and symptoms of failure) and 15 controls were

analysed by nuclear magnetic spectroscopy. Each spectroscopy divided into regions of 0.005 ppm width was integrated. After processing the data, orthogonal partial least square discriminant analysis (OPLS-DA) was performed using SIMCA-P+ software (v11.5, Umetrics, Sweden).

Results The score plot of OPLS-DA showed good separation between case and control on the level of metabolites. Several metabolites of chronic heart failure patients were altered, including the increased levels of lactate, creatine, proline, leucine, isoleucine, low-density lipoprotein, very-low-density lipoprotein and the decreased levels of histine, glucose, glutamate, valine as well as high-density lipoprotein. Multiple biochemical changes indicated dyslipidemia, oxidative stress and alteration of energy metabolism in chronic heart failure patients. Some compound could also discriminate between different stages of diseases. These findings revealed potential biological mechanisms underlying chronic heart failure.

Conclusions The NMR-based metabolomics approach demonstrates good performance to identify the plasma metabolomic markers and provides new insights into metabolic process related to chronic heart failure.