1199

Cardiorespiratory fitness is associated with markers of hepatic steatosis in patients with type 2 diabetes

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Background and aims: several studies have shown that physical activity is effective for reduction of liver fat in patients with insulin resistance and type 2 diabetes. However, few studies address the question whether level of cardiorespiratory fitness (CF) is associated with the risk of liver steatosis. Fatty liver index (FLI), hepatic steatosis index (HSI), non-alcoholic fatty liver disease liver fat score (NAFLD-LFS) have been validated for evaluation of risk of hepatic steatosis in healthy subjects and patients with type 2 diabetes. The aim of this work was to study differences in the levels of hepatic steatosis markers FLI, HSI and NAFLD-LFS between groups of type 2 diabetic patients with different level CF.
Materials and methods: 63 previously untrained patients with type 2 diabetes aged 35-75 have been enrolled. The patients have been divided in two groups according to relative VO2 max status (low CF group: VO2 max males <29 ml/min/kg, females < 25 ml/min/kg; high CF group: VO2max males ≥ 29 ml/kg/min, females ≥ 25 ml/min/kg). FLI, HSI, NAFLD-LFS were calculated by formulas, which are based on clinical features and blood biochemistry as previously published. Leisure time physical activity of participants was evaluated via Minnesota leisure time activity questionnaire and expressed in metabolic equivalent (MET).
Results: Clinical characteristics of the group were: mean age 58,6±9,5 years, mean duration of diabetes 8,0±9,7 years, mean BMI 33,5±5,5 kg/m^2, mean HbA1c 6,9 ±1,3 %, mean FLI 79,8±25,9, mean HSI 37,7±5,6, mean NAFLD-LFS 1,73±1,8, mean VO2 max 24,0±95,1 ml/kg/min, mean leisure time physical activity 33,7±25,2 (corresponds to moderate activity). HSI, FLI and NAFLD-LFS were higher in patients with low CF (FLI: Low CF group 82,0±21,3 versus high CF group 66,5±31,1, p=0,023; HSI: Low CF group 39,1±5,1 versus high CF group 34,9±5,4, p=0,004; NAFLD-LFS: Low CF group 2,2±1,7 versus high CF group 0,9±1,8, p=0,009). Serum insulin concentration was higher in low CF group compared to high CF group (versus 11,7±8,5 µV/ml versus 6,3±8,6 µV/ml (p=0,045). However, we did not observe differences between VO2 max groups in HbA1c, duration of diabetes, MET, microalbuminuria as well as cytokines associated with risk of diabetic complications (VEGF-A, Angiopoietin-2, MMP7, MMP2). There was a significant correlation between VO2 max and indices (VO2max and FLI p=0,029, VO2max and HSI p=0,000, VO2max and NAFLD-LFS p=0,005) as well as insulin (p=0,012) and waist (p=0,004).
Conclusion: markers of hepatic steatosis HSI, FLI and NAFLD-LFS are associated with cardiorespiratory fitness in previously untrained subjects with type 2 diabetes. These results provide new data on association between hepatic steatosis and cardiac complications of diabetes
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