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Cardiac alterations with preserved left ventricular ejection fraction association with hepatic steatosis in female prediabetic rats submitted to high-fat-high-sucrose diet

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Introduction

Cardiovascular disease (CVD) is known to be linked with nonalcoholic fatty liver disease (NAFLD) in type 2 diabetes, but few studies are interested in this relationship in prediabetes. This association needs to be explored especially among prediabetic women, who are at greater risk of CVD than men.

Objective

We aimed to evaluate cardiac alterations and its association with hepatic inflammation and lipid metabolism in prediabetic female rats submitted to 5 months of high-fat-high-sucrose diet (HFS).

Method

Wistar female rats were divided in 2 groups fed for 5 months with standard or HFS diet (CTRL/HFS). We analyzed cardiac function, morphology, perfusion and fibrosis by Magnetic Resonance Imaging, then rats underwent an IPGTT. The expression of genes involved in lipid metabolism and inflammation was afterwards studied in liver samples, as well as total lipid mass and triglyceride (TG) contents.

Results

5 months of HFS diet induced glucose intolerance ($p < 0.05$), and cardiac alterations with increased heart perfusion ($p < 0.01$), diastolic and systolic myocardial wall thickness ($p < 0.05$ and $p < 0.001$, respectively) but also increased diastolic left ventricular mass ($p < 0.05$). No significant differences were found in left ventricular ejection fraction, cardiac fibrosis, cardiac output and index between groups. HFS diet induced hepatic lipid accumulation with increased total lipid mass ($p < 0.001$) and TG contents, but also lipid metabolism adaptations with increased acyl CoA oxidase ($p < 0.0001$), CPT1a ($p < 0.0001$) and LCAD ($p < 0.0001$) expressions. No significant differences were found for FAS, MCAD and inflammatory cytokines (IL-6, TNF- α and MCP1) expressions.

Conclusion

HFS diet in female rats induced cardiac alterations associated with hepatic lipid metabolism adaptations characterized by increased lipid peroxidation and β oxidation. Further analyses must be performed to study the relation between cardiac and hepatic alterations observed in female prediabetic rats.