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Meeting abstract

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135 Influence of short-term excessive dietary fat intake on myocardial triglyceride content and function

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Background

Obesity is an important risk factor for causing cardiovascular disease. In blood plasma, obesity is characterized by *chronically* elevated non-esterified fatty acid (NEFA) and triglyceride (TG) levels due to lipolysis in the excessive amount of adipose tissue. As a result, TG may accumulate in non-adipose tissues such as heart and liver due to a mismatch between NEFA uptake and oxidation. In animal studies, myocardial TG accumulation is linked to cardiomyocyte apoptosis and myocardial dysfunction. Increased hepatic TG content found in obesity is of pathophysiological interest since fat accumulation in the liver is associated with several features of insulin resistance and myocardial dysfunction in healthy and diabetic subjects.

The impact of an *acute* elevation of plasma NEFA caused by excessive dietary fat on myocardial function and myocardial TG content in healthy human subjects is still unknown. Therefore, the goal of our study was to investigate the role of a high fat (HF) containing 3-day diet on myocardial and hepatic TG accumulation, and on myocardial function in healthy volunteers.

Methods

Fifteen healthy volunteers underwent MR scanning in the afternoon after two different 3-day diets. The volunteer's regular diet was used for the collection of baseline data. During the second regime, the subjects were placed on a 3-day hypercaloric diet characterized by HF content. The HF diet consisted of the same intake as the reference diet, complemented with 800 ml of whipped cream every day (140 g fat, 96 g saturated).

A 1.5 T whole-body MR scanner (Gyroscan ACS/NT15; Philips, Best, the Netherlands) was used to perform ^{1}H-magnetic resonance spectroscopy (MRS) for the assessment of myocardial and hepatic TG content. Furthermore, flow velocity mapping across the mitral valve was performed to assess left ventricular diastolic function and a standard gradient echo sequence in short axis orientation was performed to study systolic function.

Results

Mean age of the studied subjects was 25.0 ± 2 years. After the HF diet, plasma NEFA levels increased significantly (from 0.54 ± 0.07 to 0.9 ± 0.08 mM/l, $p < 0.05$) as did plasma TG levels (from 1.3 ± 0.1 to 2.9 ± 0.3 mmol/l, $p < 0.05$). Plasma glucose levels remained unchanged (4.9 ± 0.1 vs 5.0 ± 0.1 mmol/l, $p > 0.05$).

After the HF diet, hepatic TG content increased significantly compared to baseline (4.26 ± 0.72% vs. 2.00 ± 0.46%, $p < 0.05$). However, there was no difference in the myocardial TG content (0.40 ± 0.03% vs 0.38 ± 0.05%, $p > 0.05$).

Left ventricular systolic function did not change after the HF diet. As a measure of diastolic function, E/A decreased

significantly compared to baseline (1.89 ± 0.84 vs. 2.11 ± 0.10, $p < 0.05$). The decrease in E/A was accompanied by an increase in heart rate (from 60 ± 2 to 69 ± 3 bpm, $p < 0.05$) and therefore E/A was adjusted for heart rate by using a linear mixed model. Adjusted for heart rate E/A was not significantly different between the two diets ($p > 0.05$).

Conclusion

Short term high dietary fat content has no influence on myocardial TG accumulation or myocardial function, despite marked changes in plasma TG and NEFA levels. However, hepatic TG content was significantly elevated after the HF diet. These observations indicate differential, organ specific mechanisms underlying tissue specific partitioning of TG and/or fatty acids among non-adipose organs.