

Meeting abstract

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134 Metabolic imaging of the aging heart: myocardial triglyceride content as independent predictor of diastolic function

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Background

In the aging heart myocardial fatty acid oxidation is reduced, what may lead to myocardial triglyceride (TG) accumulation. In animal models of obesity and diabetes mellitus, myocardial TG accumulation has been demonstrated to be harmful to myocardial function. However, the role of myocardial TG in the physiologically aging human heart is unknown. Therefore, the purpose of our study was to evaluate the effects of aging on myocardial TG content, and to determine the effect of myocardial TG content on heart function.

Methods

Forty-three healthy male subjects participated in this study. ¹H-magnetic resonance spectroscopy (MRS) and MR imaging were performed at a 1.5 T whole-body MR scanner (Gyroscan ACS/NT15; Philips, Best, the Netherlands). The spectroscopic VOI was located in the myocardial septum and MRS was electrocardiographically triggered and navigator echoes were used for respiratory gating. 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. Blood samples were taken prior to MR scanning. To detect determinants of myocardial TG content and LV function, univariate and multivariate linear regression analyses

were performed. $P < 0.05$ was considered statistically significant.

Results

Mean age (\pm standard deviation; range) of the studied subjects was 44 ± 15 ; 20 – 66 years and BMI was 25.9 ± 3.1 ; 19.4 – 34.9 kg/m². All subjects were normoglycemic and none of the subjects suffered from hypertension.

Age was significantly correlated to myocardial TG content ($r = 0.57$, $p < 0.05$). Figure 1 shows typical examples of myocardial ¹H-MR spectra of a younger and an older volunteer. Multivariate analysis was performed to study the association between myocardial TG content and age. Therefore, myocardial TG content was entered as a dependent variable and age and BMI were subsequently entered as independent variables into the model. Furthermore, possible confounders such as plasma non-esterified fatty acids (NEFA), TG and glucose were separately entered into a model with age and BMI as independent variables. In all these models, only age showed a statistically significant association with myocardial TG content.

In addition, myocardial TG content correlated negatively with E/A (-0.68 , $p < 0.05$). Multivariate analysis was performed to study the association between E/A and myocardial TG content. Therefore, E/A was entered as a dependent variable and myocardial TG content, age, and

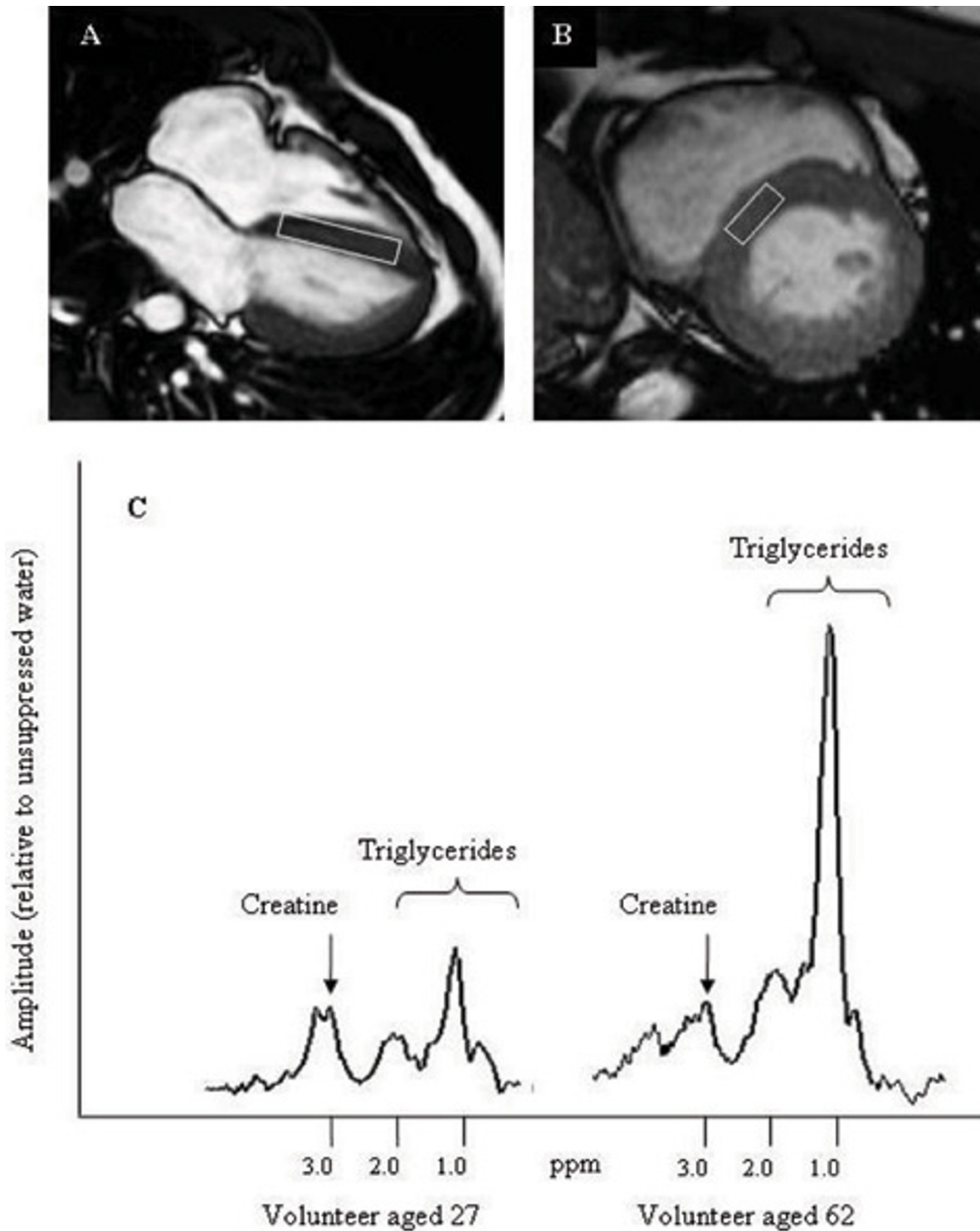


Figure 1

Myocardial voxel localization for ¹H-MRS and typical examples of ¹H-MR spectra. In the physiologically aging heart, myocardial triglyceride content increases and contributes significantly to the age-related decline in left ventricular diastolic function, independent of body mass index, blood pressure, and biochemical blood markers. Voxel position in 4-chamber (**A**) and short axis (**B**) views. (**C**) Myocardial TG content of the younger volunteer was 0.24% whereas myocardium TG content in the 62-year old volunteer was 0.82%.

BMI (which were all significantly correlated to E/A) were subsequently entered as independent variables into the model. Furthermore, possible confounders such as plasma NEFA, TG, and glucose levels, diastolic blood pressure, and heart rate were separately entered into a model with age and BMI as independent variables. The association between E/A and myocardial TG content remained highly statistically significant in all these models. Finally, left ventricular cardiac index (LVCI), a parameter of systolic function showed a significant univariate correlation with myocardial TG content. However, multivariate analysis indicated age as the sole independent predictor of LVCI.

Conclusion

In the physiologically aging heart, myocardial TG content increases and contributes significantly to the age-related decline in left ventricular diastolic function, independent of BMI, blood pressure, and biochemical blood markers.

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