Association between Echocardiographic Epicardial Adipose Tissue (EAT) Thickness and 1H-MRS Septal Myocardial Fat

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Purpose: Epicardial and myocardial fat increase with the degree of visceral adiposity and possibly contribute to obesity-associated cardiac changes [1]. We assessed whether the epicardial adipose tissue (EAT) thickness is associated to the septal myocardial fat.

Methods and Materials:

Ten consecutive obese men volunteers (body mass index 32±2 kg/m^2, age 41±7 years) underwent transthoracic echocardiogram for EAT thickness measurement. Patients were imaged using cine true-FISP (TR/TE=45/1.5 ms, slice thickness=7 mm) for EAT volume estimation and for spectrum voxel positioning. A 1.5-T ^{1}H-MRS was acquired into the septum avoiding blood contamination, adapting the voxel patient-by-patient. We used a PRESS sequence (TR/TE=1500/90 ms) and measured integral of peaks at 0.9 and 1.3 ppm for myocardial fat quantification; water peak was used as reference. Left ventricle mass and waist circumference were also recorded. Subjects had no history of coronary artery disease, heart failure, diabetes mellitus, hypertension, dyslipidemia, liver diseases, neoplasias, drug abuse. Intra- and interobserver reproducibility of the EAT thickness measurement were estimated using the intraclass correlation coefficient (ICC). Correlation and multivariate regression analyses were used.

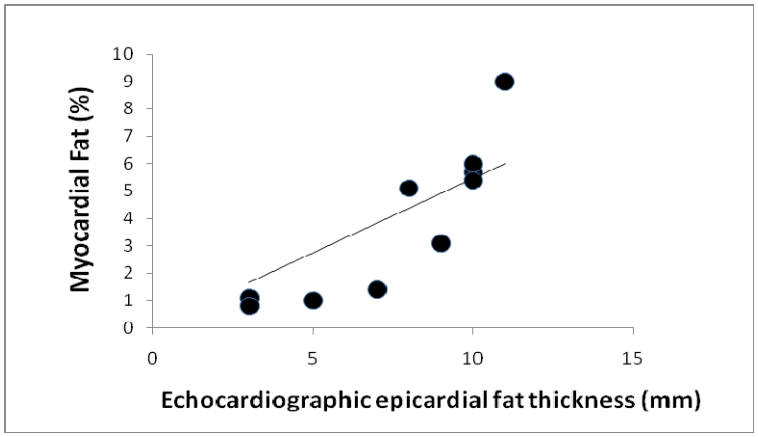

Figure 1. Regression analysis scatter plot showing the high correlation between epicardial fat thickness and myocardial fat in obese subjects.

Results:

Intra- and interobserver reproducibility of EAT thickness measurement was excellent (ICC 0.90 and 0.87, respectively). Septal myocardial fat, EAT volume and thickness ranges vary from 1% to 9%, 5 mL to 43 mL and from 3 mm to 11 mm, respectively. Septal myocardial fat showed a high correlation with EAT thickness (r=0.88, P<0.01, Figure 1), EAT volume (r=0.86, P<0.01), left ventricle mass (r=0.85, P<0.01) and waist circumference (r=0.81, P<0.01). In multivariate regression, the EAT thickness was the only significant covariate of the septal myocardial fat (r^2=0.78, P<0.01). An example of the acquired spectra is shown in Figure 2.

Conclusion:

Although this study is purely correlative and no causative conclusions can be drawn, it can be postulated that increased EAT accumulation could reflect myocardial fat in obese individuals.

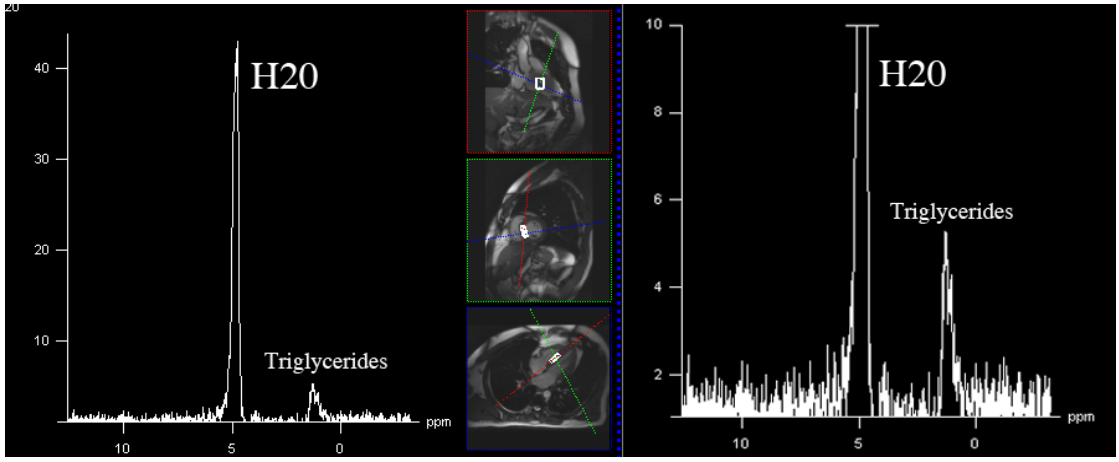

Figure 2. Example of non-water suppressed proton magnetic resonance spectrum obtained in the interventricular septum of an obese subject. Two-chamber plane (top), short-axis plane (middle) and four-chamber plane (down) MRI images show the voxel positioning in the septum [middle of the figure].

1. McGavock JM, et al. Adiposity of the heart, revisited. Ann Intern Med 2006;144:517-24