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Cocaine use as an independent predictor of cardiac steatosis: initial experience by 1H spectroscopy

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Introduction

Elevated myocardial triglyceride levels have been observed within the myocardium of diabetic and obese individuals. Use of cocaine leads to cardiomyopathy and precipitation of cardiovascular disease such as myocardial infarction, ventricular arrhythmias, and left ventricular dysfunction. Proton magnetic resonance spectroscopy (1H-MRS) has been applied to measure lipid overload in the human heart [1].

Purpose

The primary goal of the present study was to evaluate the myocardial fat in cocaine abusers. We applied 1H-MRS to quantify myocardial septal triglyceride content compared to the non-cocaine users to ascertain the prevalence and severity of cardiac steatosis among cocaine-use patients.

Methods

MRI/MRS studies were performed using a 3.0 T scanner (Tim Trio, Siemens) on 44 participants (32 cocaine users, and 12 non-users) with informed content. To measure left ventricular function, the entire heart was imaged in short-axis orientation using a retrospectively gated TrueFisp sequence. The short-axis along with the two and four chamber views were used to position the spectroscopic volume (6-8 ml voxel) within the interventricular septum. Myocardial 1H-MRS spectra were obtained with ECG and navigator gated with water suppressed (32 averages) and unsuppressed (4 averages) PRESS, TR/TE = 1-RR/30 ms. Fat content was quantified with Amares/MRUI and related to water in unsuppressed spectra and expressed as fat/water percent ratios.

Results

The characteristics of study participants are presented in Table 1. Using a 1% cut-off for cardiac steatosis, the overall prevalence of cardiac steatosis was 32% (14/44). The prevalence of cardiac steatosis in cocaine users was significantly higher than that in those who did not use cocaine (65.7% in cocaine users, and 16.7% in cocaine non-users, $p < 0.004$). Exact logistic regression analysis indicated that after controlling for age, gender, glucose, triglycerides, and systolic blood pressure, cocaine use was associated with a 14-fold risk of cardiac steatosis (adjusted OR 13.8, 95% CI:1.1,169).

Conclusion

This pilot study demonstrated that cocaine use is significantly associated with cardiac steatosis. Human studies indicate that cardiac steatosis is associated with impaired left ventricular filling dynamics and diastolic dysfunction [2]. However, we cannot discriminate whether there is a causal relationship between increased myocardial TG content and reduced left ventricular function in our current study due to limited number of participants. Further studies are under way to make these distinctions.

Table 1: Characteristics of Study Participants of the Pilot Study

	Cocaine use N = 32	**never use N = 12**
Female gender	45.7 ± 6.7	42.8 ± 9.5
Smoking/Diabetes	39.4%/9.1%	46.2%/0.0%
Systolic/Diastolic bp (mmhg)	130 ± 18/81 ± 12	123 ± 37/79 ± 18
Cholesterol (mg/dL)	174 ± 36	168 ± 35
Fasting glucose/Triglycerides (mg/dL)	97 ± 36/131 ± 103	84 ± 10/62 ± 25
Body Mass Index	27.5 ± 5.5	28.5 ± 6.7
LV end systolic/diastolic volume (mL)	61 ± 17/152 ± 34	69 ± 18/166 ± 27
Ejection Fraction (%)	60 ± 5	58 ± 8
LV mass (gm)	114 ± 28	118 ± 21

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