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Long-term cocaine use is associated with premature alterations in regional aortic strain and distensibility measured by magnetic resonance imaging

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Introduction

Long-term cocaine use has been associated with regional systolic and diastolic left ventricular dysfunction, hypertension and aortic dissection. The repetitive cardiovascular stress induced by cocaine use may lead to premature arterial stiffening but data on this relationship are scarce and inconsistent.

Purpose

We studied the relationship between regional aortic stiffness measured by MRI and long-term cocaine use.

Methods

We enrolled 46 consecutive subjects from an addiction clinic: 33 long term cocaine users (13 men, 20 women, mean age: 46 ± 7 yrs, mean years of cocaine use: 15 ± 8) and 13 non-cocaine users (6 men, 7 women, mean age: 43 ± 9 yrs). Aortic stiffness of the ascending and descending aorta was determined by MRI from aortic strain (AS: relative difference in cross-sectional area) and distensibility (AD: aortic strain normalized by pulse pressure) using an automated contours detection method applied to modulus images of a phase-contrast acquisition perpendicular to the ascending aorta (Art-Fun, INSERM). Blood pressure was measured by a brachial cuff during aortic MRI. Drug and smoking habitus was determined by a standardized questionnaire.

Results

SBP was slightly higher in the cocaine group vs. non-users (130 ± 18 vs. 123 ± 37 mmHg) but pulse pressure was comparable (47 ± 12 vs. 46 ± 10 mmHg respectively) and hypertension was similarly distributed (30% vs. 38%). Total cholesterol was also slightly higher (174 ± 36 vs. 168 ± 35 mg) and current cigarette smoking more prevalent in the cocaine group (88% vs. 30%). Only 3 subjects of the cocaine group were diabetics and no diabetes in non-users. Aortic strain and distensibility were lower in the cocaine group vs. non-users as summarized in Table 1. Univariate analysis showed a negative correlation between aortic strain and distensibility and duration of cocaine use. After further adjustment for age, gender, cholesterol, smoking and diabetes the duration of cocaine use was an independent predictor of descending aortic function with a significant average decrease in strain of 2.5% ($p = 0.02$) and a trend for a decrease in distensibility of 4.5 $\times 10^{-3}$.kPa^{-1} ($p = 0.14$) for 1 year of cocaine use.

Conclusion

Long-term cocaine use is associated with premature regional stiffening of the aorta. This association was stronger for the descending aorta for which duration of cocaine use was found to be an independent predictor of vascular function beyond the effects of age and traditional risk factors.

Table 1: Comparison of the aortic ascending and descending strain and distensibility of the cocaine

	Non-Users Controls	Cocaine Use
Ascending Aortic Strain, %	18 ± 4	17 ± 8
Ascending Aortic Distensibility, $10^{-3}.kPa^{-1}$	35 ± 13	29 ± 16
Descending Aortic Strain, %	18 ± 6	16 ± 5
Descending Aortic Distensibility, $10^{-3}.kPa^{-1}$	31 ± 14	27 ± 13