Non-Invasive Detection of Early Cardiovascular Risk in People Living with HIV

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Synopsis

HIV is a risk factor for accelerated Cardiovascular Disease (CVD). CVD is the leading cause of mortality among Hispanics. Hispanics in the US are disproportionately affected by the HIV epidemic with higher rates of overall HIV related morbidity and mortality. Therefore, HIV infection is likely to exacerbate adverse CVD outcomes among Hispanics. The objective of this study is to identify early markers of CVD risk among Hispanics living with HIV.

Aim

Aim 1: To determine whether Hispanic men and women have greater vascular dysfunction.
Aim 2: To determine whether Hispanic men and women have greater epicardial adipose tissue (EAT) when compared to other ethnicities.

Methodology

Design: Cross-sectional study.
Population: Enrolled 87 subjects, however at the time of this interim analysis 38 participants had completed the study.

Inclusion Criteria:
- Participants included Hispanics (H)
- Non-Hispanics (NH)
- Infected with HIV
- 30-50 years old
- No previous CVD
- Undetectable viral load
- Stable anti-retroviral regimen in the last 6 months

Data Collected Included:
- Demographic
- BMI
- Weight and Waist girth
- Blood pressure
- Total cholesterol
- LDL/HDL/non-HDL/triglycerides
- C-reactive protein
- Fasting plasma glucose
- Fasting plasma insulin

Statistical analyses were carried out using descriptive analysis and linear regression analysis for predictors of FRS measures adjusted for age.

Methodology

Measures or early CVD were obtained with non-invasive tools:

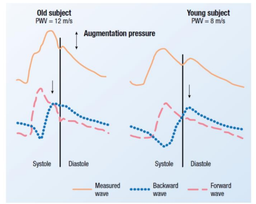
Arterial stiffness. Arterial tonometry of the carotid, femoral and radial arteries (measures included **central augmentation index** -AI, **peripheral -AI**, **radial pulse wave velocity** -PWV, and **femoral PWV**)

Epicardial adipose tissue (EAT) thickness was assessed by echocardiogram.

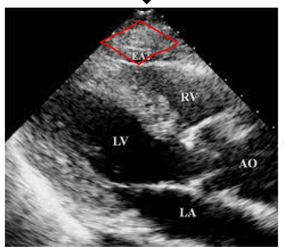
The Framingham Risk Score (FRS) for 10-year coronary heart disease events was calculated (age, sex, tobacco use, total cholesterol, HDL cholesterol, systolic BP, BP medication use)

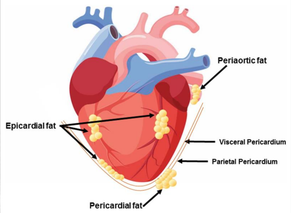
Central Aortic Pressure & PWV

With arterial stiffness, pulse wave velocity increases and the reflected wave returns during late systole, summating with the forward systolic wave and increases the central systolic pressure and cardiac afterload.



>5mm indicates increase of EAT





87 participants have been enrolled to date. Of these persons, 38 have completed their assessment (Hispanics n=29, Blacks n=6, White n=3). Participants were of a mean age of 42 years, 82% men, 76% Hispanic and 24% non-Hispanic (see Table 1).

Results

Table 1. Demographic and cardiometabolic characteristics of the study sample (N=38).

		Hispanic (n=29)		Black (n=6)		White (n=3)	
		M	SE	M	SE	M	SE
Demographic characteristics							
Age	(years)	41.7	1.1	45.4	2.4	41.6	3.4
Sex	(% men)	82.8		50.0		66.7	
Education	(years)	13.7	0.7	13.5	1.5	13.3	2.1
Current smoker	(%)	13.8		33.3		100.0	

- The cohort mean BMI was 26.7±1 kg/m^2 and 45% met at least two criteria for metabolic syndrome.
- Metabolic syndrome criteria met were high waist girth 24%, high blood pressure 18%, high fasting glucose 16%; high total cholesterol 21%, high triglycerides 26%, low HDL 45%, high LDL 18%, high TC/HDL ratio 68%

Regression Analysis: Predicting Framingham Coronary Event Risk Score

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	16.407	15.372		1.067	.296			
	Epicardial Fat	-.264	.377	-.135	-.699	.491	-.074	-.141	-.121
	Waist girth	-.001	.007	-.030	-.165	.870	-.048	-.034	-.028
	Central AI	9.000E-5	.179	.000	.001	1.000	-.082	.000	.000
	Peripheral AI	-.046	.146	-.307	-.315	.756	-.025	-.064	-.054
	PWV femoral	.028	.583	.010	.049	.962	-.015	.010	.008
	PWV radial	1.000	.482	.445	2.077	.049	.355	.390	.359
	Lipid meds	-4.807	3.443	-.273	-1.396	.175	-.105	-.274	-.241
	BP meds	-4.991	3.600	-.283	-1.386	.178	-.280	-.272	-.239

a. Dependent Variable: FRAM_LDL_SCORE

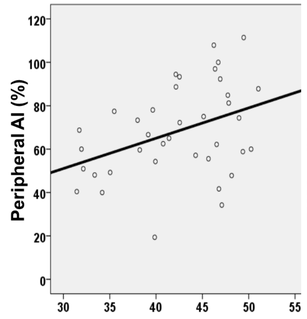
- Regression analyses predicting FRS included each of the cardiovascular measures and controlled for lipid and anti-hypertensive medications.
- **Results demonstrated radial PWV to be the only significant independent predictor of increased coronary event risk (r = 0.36, p <.05)**

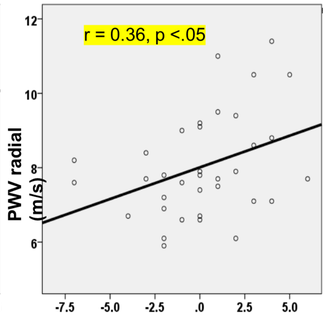
Table 2. CVD Risk Measurement Results by Ethnic Group

		Hispanic (n=29)		Black (n=6)		White (n=3)	
		M	SE	M	SE	M	SE
Central AI	(%)	15.2	2.8	22.5	6.3	22.9	8.7
Peripheral AI	(%)	67.3	3.5	75.3	8.3	76.5	11.5
Central PP	(mmHg)	28.1	1.2	29.3	2.6	29.0	3.6
Femoral PWV	(m/s)	6.6	0.2	8.2	0.5	6.7	0.5
Radial PWV	(m/s)	8.0	0.3	7.5	0.6	9.9	0.8
Epicardial Adipose Tissue	(mm)	4.2	0.3	3.7	0.7	3.8	0.9

[a] measures adjusted for age

- Sample size in the non-Hispanic group was too small to analyze ethnic differences currently.
- However, in the entire cohort, older age was significantly associated with greater central AI (r = 0.37, p =.01) and peripheral AI (r = 0.38, p =.009).
- Increasing arterial stiffness was significantly associated with a greater Framingham Risk Score (r=0.36, p<.05). See figures below.





Conclusion

- This study findings show that early CVD risk indexed by metabolic syndrome criteria is substantial among this diverse group of patients living with an HIV infection.
- Notably, radial PWV is a moderate predictor for about 36% of the 10-year coronary event risk indexed by the FRS.
- Although measures of arterial stiffness are clinically available tools, they are not routinely used in clinical practice to assess CVD risk.

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