Longitudinal Increases in Waist Circumference are Associated with HIV-serostatus, Independent of Antiretroviral Therapy

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Background:

Body shape changes are common among HIV-infected individuals receiving highly active antiretroviral therapy (HAART). However, our knowledge regarding the relative contributions of antiretroviral therapy, HIV disease, and patient factors, including aging, is limited by the few prospective studies with an HIV-negative control group.

Purpose:

•To determine the association between cumulative exposure to each of the 3 major classes of antiretrovirals and changes in anthropometric measurements

•To determine the changes in anthropometric measurements attributable to time effects (i.e. aging)

•To determine whether time-related changes in anthropometrics differ by HIV status

Methods:

Study Population:

The Multicenter AIDS Cohort Study is an ongoing cohort of men who have sex with men, both HIV-infected and HIV-seronegative, initially enrolled in 1984. Since September 1999 (baseline visit), circumference measurements of the waist, hip, thigh, and arm have been obtained at each semi-annual visit.

Outcome Measures:

- Body Mass Index (BMI)
- Waist Circumference
- Hip Circumference
- Thigh Circumference
- Mid-Arm Circumference

Independent Variables:

•Cumulative exposure to PIs
•Cumulative exposure to NNRTIs
•Cumulative exposure to NRTIs (truncated 3 yrs before baseline visit)
•Time since baseline visit
•HIV status
•Time * HIV status
•Nadir CD4 cell count (zeroed for HIV-uninfected)
•Age at baseline visit
•BMI at baseline visit for circumference measurements

Statistical Analysis:

The average change between 1999 and 2004 in each of the 5 outcome measures was estimated using mixed-effects regression models.

Results:

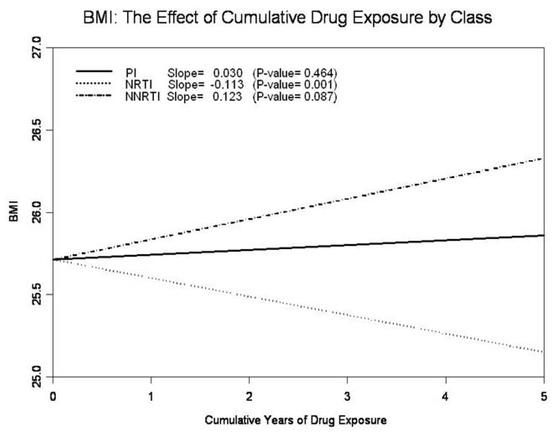
Table 1 shows the baseline demographic characteristics of the cohort. Compared to the HIV-seronegative group, the HIV-infected groups were younger and had a lower BMI and body circumference measurements.

Table 1: Baseline Characteristics (1999)

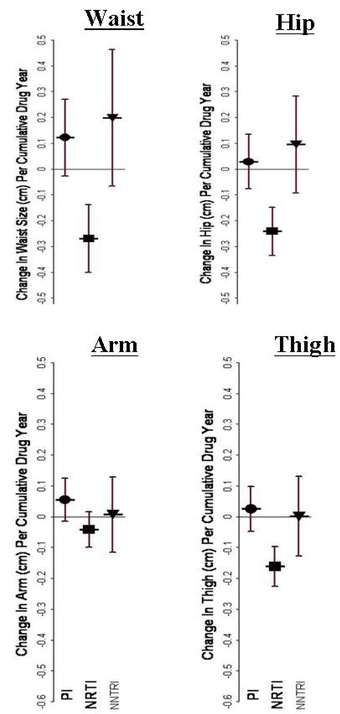
	HIV- n=392	HIV+ n=661	P value
Caucasian n (%)	334 (85%)	548 (83%)	0.328
Age	48.3 (7.7)	45.7 (6.7)	<0.001
BMI (kg/m^2)	27.3 (4.8)	25.3 (3.5)	<0.001
Waist (cm)	96.4 (14.1)	90.2 (9.7)	<0.001
Hip (cm)	101.3 (9.3)	95.0 (8.0)	<0.001
Arm (cm)	33.3 (3.7)	31.7 (3.9)	<0.001
Thigh (cm)	54.1 (6.0)	50.8 (5.8)	<0.001

Body Mass Index:

NRTIs are associated with a BMI decrease; NNRTIs and PIs with a null effect.



Body Circumference Measurements: Cumulative NRTI exposure was associated with significant decreases in waist, hip, and thigh circumferences; NNRTIs and PIs with a

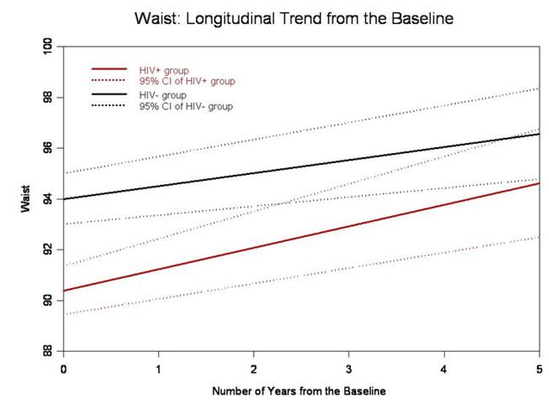


Effects of Time and HIV status: Significant increases in BMI, waist and hip circumference were observed for each additional year of follow-up, regardless of HIV status (Table 2).

Table 2

	Year from baseline			(Year from baseline)*HIV+		
	Est.+	SD	P	Est.+	SD.	P
BMI (kg/m^2)	0.2	0.04	<0.001	-0.01	0.08	0.261
Waist (cm)	0.5	0.08	<0.001	0.33	0.15	0.022
Hip (cm)	0.3	0.06	<0.001	0.11	0.10	0.266
Arm (cm)	-0.1	0.10	0.410	0.02	0.14	0.882
Thigh (cm)	-0.1	0.04	0.103	0.13	0.08	0.073

Effects of Time and HIV status (continued) : Despite smaller measurements at baseline, more rapid increases in waist circumferences occurred in HIV-infected men compared to HIV-negative controls over the study interval.



Conclusions:

•Cumulative exposure to NRTIs was associated with decreases in BMI and circumference measurements.

•Cumulative exposure to PIs or NNRTIs were not associated with changes in circumference measurements.

•Increases in BMI, waist, and hip were observed regardless of HIV status, likely representing effects of aging.

•HIV-infected men showed a more rapid increase in waist circumference compared to HIV-negative controls over time, after adjustment for the effect of antiretrovirals and baseline characteristics. This may represent a "return to health" phenomenon.

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