British HIV Association
BHIVA

Dr Cameron Holloway

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Comprehensive Cardiac Magnetic Resonance Reveals HIV is Associated with High Burden of Myocardial Disease

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Disclosures: Nil

Background

-Higher incidence heart disease

Untreated:

- -Myocarditis
- -Heart failure
- -Pulmonary hypertension
- -Pericardial effusion

Treated:

-Coronary disease

-Metabolic Complications

-?Myocardial disease

-Why?

-Management?

HIV -Cardiomyopathy

HIV -Cardiomyopathy

HIV

Myocarditis

-increased HIV proteins

-opportunistic infections

Inflammation

-Chronic infection

Malnutrition

-selenium deficiency

Metabolic

-Elevated Free Fatty Acids

-Hyperglycaemia

Coronary disease

-HAART

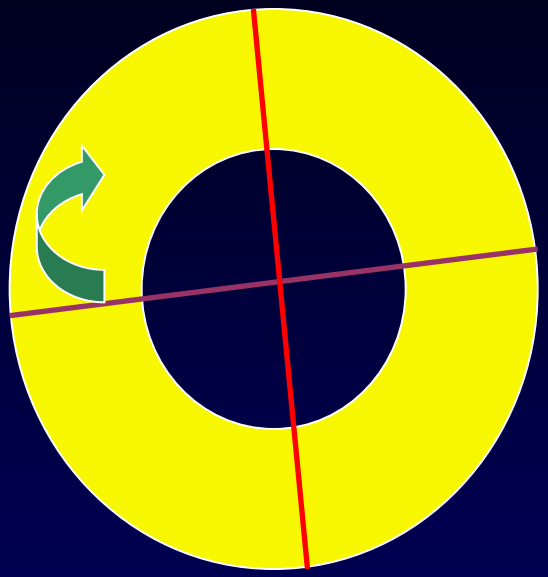
-mircovascular dysfunction

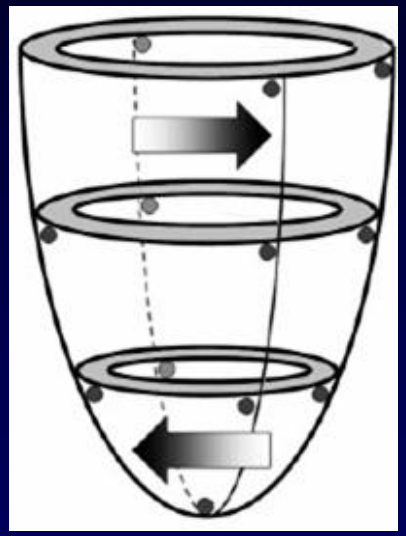
HAART

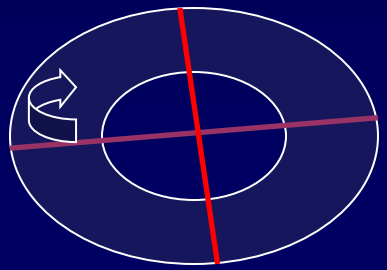
-NRTI

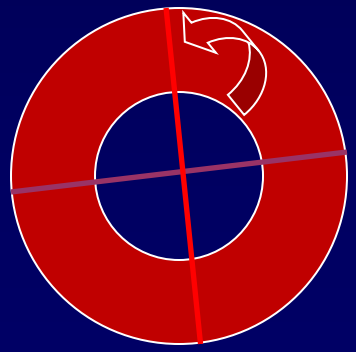
-SMART trial

Function – 3D



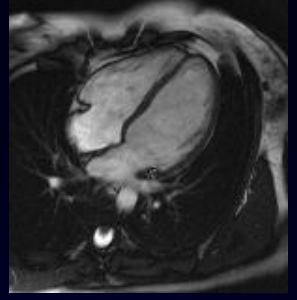


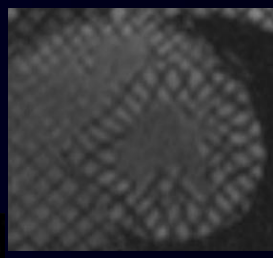




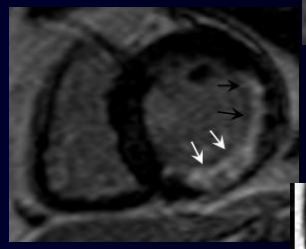
Cardiac MR Imaging

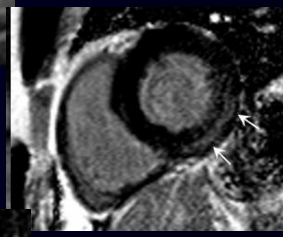
Function

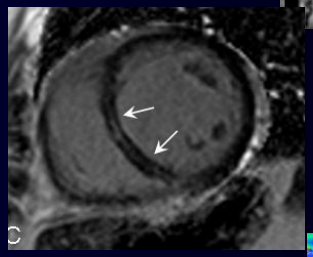




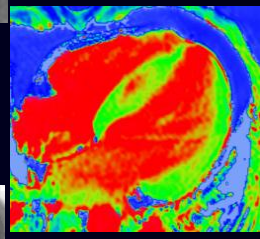
Fibrosis



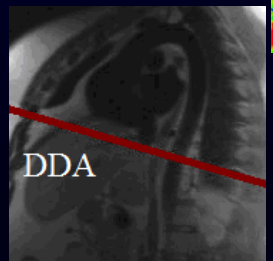




T1 Mapping



Vascular Distensibility



Hypotheses

-HIV related heart disease has multiple aetiologies which can be determined in a comprehensive study, including cardiac MR imaging and spectroscopy

-Metabolic derangements in chronic HIV infection lead to cardiac steatosis, energetic abnormalities and subsequent contractile dysfunction in patients with HIV

-cART

-leads to cardiac lipodystrophy and mitochondrial abnormalities

-alters central vascular function via modulation of circulating molecules associated with endothelial inflammation

Study Design

An observational study to define the characteristics of myocardial disease in patients with HIV
&
Contols

↓

Subjects with HIV
n = 104
ages >18 y.o.
range of disease duration & severity

Controls
n = 39
Matched for age and co-morbidities

Recruitment in Outpatient clinics

All subjects

20mins	Consent
	History
10mins	Biomarkers, ECG, Bio-impedance measurements
60mins	Cardiac MR (function, fibrosis)
60mins	Cardiac MRS (^{1}H)
20mins	Echocardiography (diastolic function)

Total 3 hours

Baseline Characteristics

	HIV	Control
Age (yrs)	44 ± 1	44 ± 1
Male (%)	77	67 *
MSM (%)	53	23 *
BMI (kg/m^2)	26 ± 1	25 ± 1
Heart rate (bpm)	64 ± 1	67 ± 2
Blood Pressure (mmHg)	131/78	133/79
Hypertension (%)	12 ± 3	8 ± 6
Smoking (%)	39	23 *
Hypercholesterolaemia (%)	13	15

- < 0.05 *

Plasma Metabolites

	HIV	Control
Cholesterol (mM)	4.5 ± 0.1	4.4 ± 0.2
HDL (mM)	1.1 ± 0.0	1.3 ±0.1**
LDL (mM)	2.7 ± 0.1	2.7 ± 0.1
Chol/HDL	4.2 ± 0.1	3.6 ± 0.1 **
Triglyceride (mM)	1.6 ± 0.3	0.9 ± 0.2 **
Glucose (mM)	5.2 ± 0.1	4.9 ± 0.1*
Insulin (mU/l)	53 ± 3	46 ± 6
NEFAs (mM)	0.5 ± 0.1	0.5 ± 0.1

* < 0.05 ** < 0.01 *** <0.001

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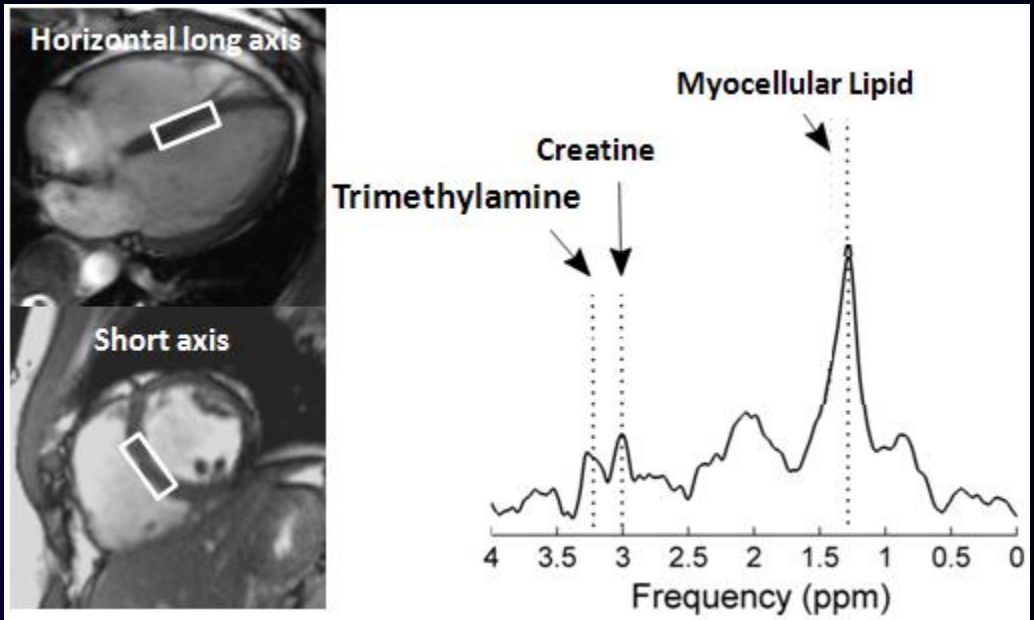
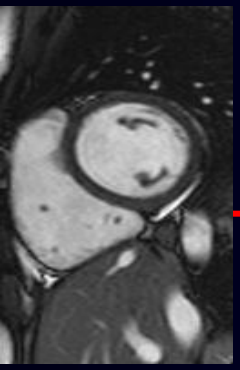
Cardiac Lipids



	HIV	Control
Cardiac fat (%)	0.59 ± 0.2	0.40 ± 0.2 **
Hepatic fat (%)	7.2 ± 3.4	2.1 ± 0.5 ***

* < 0.05 ** < 0.01 *** <0.001



Cardiac Function

	HIV	Control
Ejection Fraction %	68 ± 1	71 ± 1 *
Peak Longitudinal Systolic strain rate	-12.4 ± 0.5	-14.2 ± 0.5 **
Peak Longitudinal Diastolic strain rate	36 ± 2	46 ± 6 ***
Peak Circumferential Systolic strain rate	-17.5 ± 0.2	-18.9 ± 0.5 **
Peak Circumferential Diastolic strain rate	71.5 ± 2	89.0 ± 6 ***
E/A	1.1 ± 0.0	1.3 ± 0.1 *

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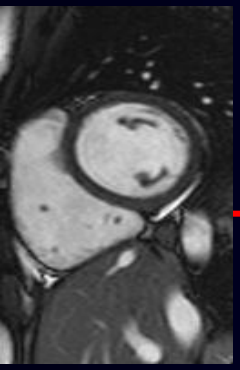

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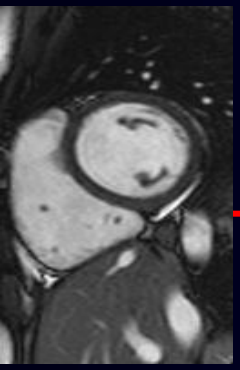
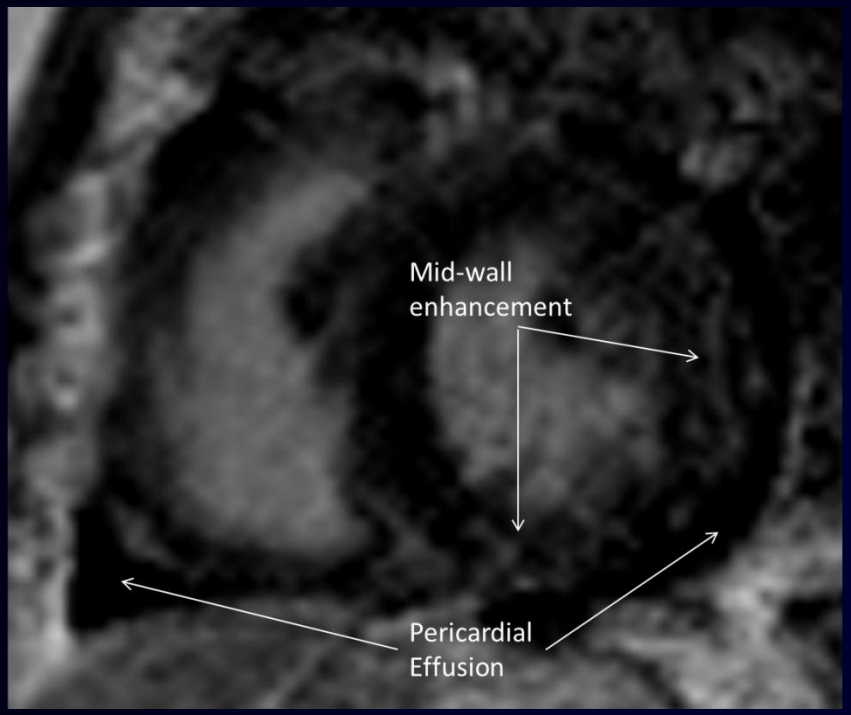


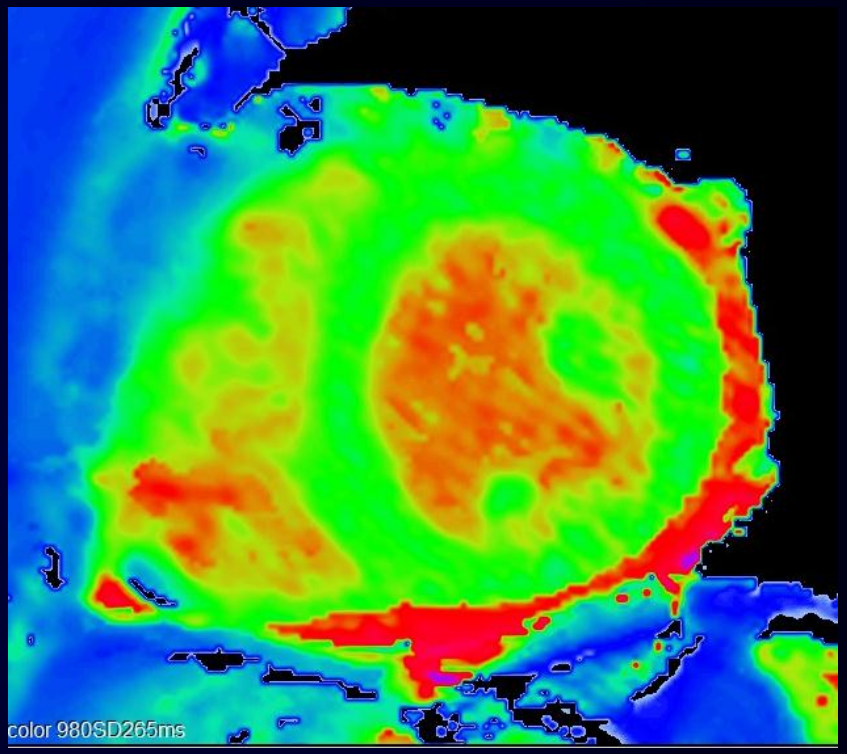
Cardiac Function

	cART	cART naïve
Ejection Fraction %	68 ± 1	64 ± 2 ***
Peak Longitudinal Systolic strain rate	-17.4 ± 0.5	-17.4 ± 0.5 *
Peak Longitudinal Diastolic strain rate	35 ± 2	41 ± 6
Peak Circumferential Systolic strain rate	-12.4 ± 0.2	-12.7 ± 0.5 *
Peak Circumferential Diastolic strain rate	71.5 ± 2	74.0 ± 6
E/A	1.2 ± 0.0	1.0 ± 0.1

* < 0.05 ** < 0.01 *** <0.001

Cardiac MR findings





	HIV	Control
Cardiac Fibrosis	88%	15% ***

*** <0.001

Conclusions

Asymptomatic patients with HIV:

- Metabolic abnormalies- lipids and glucose
- Increased cardiac lipids
- Alterations in cardiac function- cART naive
- Ongoing inflammation
- 88% have evidence of myocardial fibrosis
- Impaired vascular function (poster 113)

HIV -Cardiomyopathy

HIV

Myocarditis

-increased HIV proteins

-opportunistic infections

Inflammation

-Chronic infection

Malnutrition

-selenium deficiency

Metabolic

-Elevated Free Fatty Acids

-Hyperglycaemia

Coronary disease

-HAART

-mircovascular dysfunction

HAART

-NRTI

-SMART trial

Conclusions

Asymptomatic patients with HIV:

- High burden of cardiac disease
- - Ongoing inflammation and metabolic risk
- cART – cardiometabolic abnormalities → LV dysfunction
- Implications for drug development and cART use

Cardiac abnormlties- HIV as a differential

Prospective drug studies are needed

The Research Team

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