The Additive Value of Coronary Calcium in Identifying Cardiovascular Risk in Ageing People With HIV

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BACKGROUND

In people without HIV, high Coronary Artery Calcium Scores (CACS) correlate with an increased risk of major cardiovascular and cerebrovascular events (MACE). HIV is independently associated with raised CACS, however data on factors associated with increased CACS and MACE (except smoking and diabetes) in HIV are scarce. Although knowledge on the importance of statin use to prevent MACE is clear (REPRIEVE), cost-effective investigations and interventions to identify and manage MACE in ageing people with HIV is vital.

METHODS

Data were collected on all individuals with HIV, at a single centre in London, UK, who underwent a CACS between 2009-2019, including demographics, laboratory and clinical information at the time of CACS, and MACE assessed over 15 years. Descriptive statistics, univariate and multivariate regression analyses using logistic regression were performed using STATA15.

Table 1: Summary of characteristics

Demographics	
Median age at time of CACS	55 (52-59)
Number of males (%)	724 (93.1%)
HIV related characteristics	
Median number of years post HIV diagnosis	16 (10-21)
Median CD4 count	639 (473- 826)
Number of individuals with VL>50 (%)	4.6 (n=36)
Cardiovascular risk factors at the time of first CACS	
Median Qrisk2	9.6 (6.45- 14.77)
Number of individuals who are current smokers (%)	262 (33.6%)
Number of individuals who drink more than 14 units of alcohol a week (%)	92 (11.8%)
Median BMI	25.5 (23.3- 28.0)
Median systolic BP	129 (120- 140)
Number of individuals diagnosed with hypertension on treatment (%)	168 (21.6%)
Number of individuals diagnosed with hyperlipidaemia (%)	399 (51.2%)
Number of individuals diagnosed with Diabetes (%)	46 (5.9%)

RESULTS

Of 779 individuals with a CACS, median (IQR) age at the time of CACS was 55 years (52-59), 93% were male, median number of years post HIV-diagnosis were 16 (10-21), CD4 count was 639 (473-826), 5% had a detectable viral load (VL), 34% were current smokers, 12% reported alcohol intake >14 units/week, Qrisk2 was 9.6% (6.5-14.8), BMI was 25.5 (23.3-28.0) and systolic BP was 129 (120-140).

Median (IQR) CACS was 2 (0-54) with median centile 25th-50th.

All individuals who underwent a CACS underwent an Echocardiogram. Some individuals underwent functional imaging including myocardial perfusion scans (6.3%; n= 49) or cardiac MRI (4.9%; n=38). Based on symptoms and further investigations, 54 individual (6.9%) underwent a coronary angiogram which was for both diagnostic and therapeutic purposes.

Table 2: Predictors of MI, stroke or heart failure

Risk factor	Odds ratio (confidence interval) {p value}
Demographics	
Age	1.03 (0.97- 1.11) {0.26}
Gender	0.17 (0.25- 1.09) {0.06}
Ethnicity-Black	2.90 (0.95- 8.88) {0.06}
Ethnicity-Mixed	6.81 (1.06- 43.98) {0.04}
Ethnicity-Other	0.41 (0.05- 3.18) {0.39}
HIV characteristics	
CD4 count	1.00 (1.00- 1.00) {0.83}
Undetectable viral load	0.43 (0.13- 1.44) {0.17}
Number of years with HIV	1.03 (0.99- 1.07) {0.19}
CACS compared to reference group <25th	
Centile 25-50th	1.58 (0.69- 3.60) {0.28}
Centile 50-75th	1.68 (0.72- 3.96) {0.23}
Centile 75-90th	4.01 (1.51- 10.65) {0.05}
Centile >90th	5.11 (1.89- 13.78) {0.00}
Q-risk2 compared to reference group <10%	
10-20%	2.79 (1.15- 6.74) {0.02}
>20%	2.28 (0.52- 9.96) {0.28}
Medical conditions	
Hyperlipidaemia	0.54 (0.24- 1.22) {0.14}
Diabetes	2.01 (0.68- 5.92) {0.21}
Chronic kidney disease stage 3 or more	0.83 (0.31- 2.20) {0.70}
Other cardiovascular risk factors	
Current smoker	0.80 (0.40- 1.60) {0.53}
Alcohol >14 units/week	0.28 (0.08- 1.05) {0.06}
Body mass index	1.04 (0.97- 1.12) {0.25}
Systolic Blood Pressure	1.02 (1.00- 1.04) {0.10}
Total Cholesterol	1.73 (0.52- 5.76) {0.37}
Triglycerides	1.03 (0.61- 1.74) {0.92}
High density Lipoprotein Cholesterol	0.21 (0.02- 2.91) {0.25}
Low Density Lipoprotein Cholesterol	1.40 (0.43- 4.53) {0.58}
Ratio Total/ High density Lipoprotein Cholesterol	0.59 (0.29- 1.18) {0.13}
Prescribed statins	1.90 (0.86- 4.20) {0.11}
Family history of cardiovascular disease under age of 60 years	1.02 (0.20- 5.30) {0.98}

Multivariate analysis showed that significant predictors of MI, stroke and heart failure are:

- Mixed ethnicity- OR *6.81*
- **CACS centile 75- 90th- OR *4.01***
- **CACS centile >90th- OR *5.11***
- Q-risk2 of 10-20%- OR *2.79*

MACE occurred in 95 individuals (10.7%): 2.7% (n=21) myocardial infarction (MI), 2.3% (n=18) stroke and 3.6% (n=28) heart failure, 5.4%. Forty two individuals underwent revascularisation of which 8 underwent coronary artery bypass grafts. Other outcomes included death from any cause in 6.4% (n=50).

Univariate analysis found that significant risk factors associated with MI were age, being of a mixed ethnicity, CACS>90th percentile compared to <25th percentile, Qrisk2, Diabetes and detectable VL.

The multivariate model only showed two significant predictors of MI: mixed ethnicity with odds ratio(OR) of 9.31(p=0.05) and CACS>90th percentile OR of 6.73(p= 0.02).

Predictors of MI, stroke or heart failure are shown in Table 2. Significant predictors included being of mixed ethnicity with OR of 6.81 (p=0.04), CACS centile 75- 90th with OR 4.01 (p=0.05), CACS centile >90th with OR of 5.11 (p= 0.00) and Q-risk2 of 10-20% with OR of 2.79 (p= 0.02)

CONCLUSIONS

In this cohort, CACS rather than cardiovascular risk calculated by Q-risk was the strongest predictor of MACE. CACS is a useful tool in stratifying persons who would most benefit from aggressive risk factor modification and further investigation. Future understanding on whether total plaque burden on coronary CT angiography, peri-coronary fat analysis, or cardiac MRI can refine risk prediction further is needed.

ADDITIONAL KEY INFORMATION

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