Cardiovascular disease burden in HIV positive patients: an analysis of the rate of increase of CT coronary calcium scores after a five year interval

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1. Background

- •HIV positive patients have an increased risk of cardiovascular disease (CVD), compared to the non-HIV population.1
- •The degree of stable, calcified atherosclerotic plaque can be assessed using CT coronary calcium (CorCa) scoring (Fig. 1).2
- •American Heart Association: CorCa >100 Agatstons, consider statin therapy, aspirin and ACE inhibitor.3
- •Aim: To further our understanding of the burden of CVD in HIV positive patients by analysing the rate of increase of CorCa scores after a five year

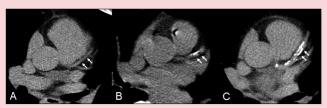


Fig. 1: Coronary artery calcium score measurements of the left anterior descending coronary artery. (A) Coronary Artery calcium score of 0, (B) Coronary artery calcium score 31, (C) Coronary artery calcium score of 690. (Images from Scholte et al., 2011).

2. Method

PACS search 2007-2016 HIV+ patients 1976 CorCa scores obtained

Patients with baseline and Y5 Cor Ca scores selected for analysis

Smoking status; cholesterol, triglycerides, diabetes, statin, antiretroviral (ARV) regimen recorded from clinical records

Analyses:

- 1. Descriptive
- 2. Linear multivariate

FORM: Increase= baseline score + risk factors + ARV and ARV interaction + random error

3. Results and Discussion

- Forty-seven patients had CorCa scores at Y1 and Y5.
- CorCa scores ranged from 0 to 916 Agatstons, median 13.5.
- Twenty-two (46 %) of patients had CorCa score of zero at year 1.
- Twenty-nine (62 %) of patients had an increase in their CorCa score with the largest increase being 454 Agatstons (doubling).
- Twenty patients (year 1) and 29 patients (year 5) were predicted to have moderate to extensive atherosclerotic disease (Table 1).

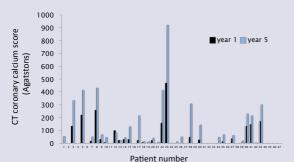


Fig 2: CT coronary calcium scores for 47 patients at year 1 and at year 5

 Table 1: Classification of risk of cardiovascular disease predicted from CT coronary
calcium scores for 47 HIV positive patients at year 1 and at year 5. Table based upon Rumberger model (1995).

| CT CorCa score | Plaque Burden | Clinical interpretation (likelihood of CVD) | No. patients year 1 | No. patients year 5 |
|----------------------|------------------|---|---------------------------|---------------------------|
| 0 | none | Very low risk CVD Likelihood CAD < 5% | 22 | 16 |
| 1-10 | minimal | Significant CAD very unlikely | 5 | 2 |
| 11-100 | mild | Likely mild/minimal coronary stenosis | 12 | 17 |
| 101-400 | moderate | Moderate non-obstructive CAD highly likely | 7 | 8 |
| Over 400 | extensive | High likelihood of at least 1 significant coronary stenosis (> 50 % diameter) | 1 | 4 |

3(b). Multivariate analysis

Baseline CorCa score was greatest predictor of 5 y CorCa score (Table 2)

Noteworthy relationships between covariates:

- •Age + >in CorCa: largest increase occurs at age 50-55 (Fig. 3)
- •Smoking status: no evidence of effect on CorCa increase.
- •Baseline score and statin status: for 23 patients on statin therapy, median increase in CorCa was high: 55, IQR (4.7,184.2).
- •No evidence that any ARV's were associated with increase in CorCa.

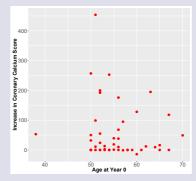


Fig 3: Increase in CorCa scores for patients of different ages

Table 2: Examples of co-efficient estimates in reduced model.

| 0.85781 | | |
|-----------|--|---|
| 0.03701 | 0.08199 | 7e-13 |
| -2.69319 | 1.16815 | 0.026543 |
| -17.02493 | 6.07097 | 0.007820 |
| -52.30191 | 15.96052 | 0.002209 |
| 24.08417 | 15.84790 | 0.136651 |
| 34.27528 | 18.43665 | 0.070572 |
| -0.68478 | 0.28121 | 0.019564 |
| | -2.69319 -17.02493 -52.30191 24.08417 34.27528 | -2.69319 1.16815 -17.02493 6.07097 -52.30191 15.96052 24.08417 15.84790 34.27528 18.43665 |

Conclusions

- Typical members of this HIV positive population seem to be at significant risk of increases in CorCa score and therefore of CVD.
- Baseline CorCa score was greatest predictor of 5 y CorCa score.
- ARV choice does not seem to affect the rate of increase of CorCa score, although the large number of ARV's combined with the small sample, limit
- Although preliminary, this study represents a starting point for further assessing the burden of CVD in the HIV population as a large number of patients are due to be re-scanned in the next 3-5 years.

References 1. Hemkens, L.G. & Bucher, H.C. (2014) HIV infection and cardiovascular disease. Eur Heart J. 35: 1373-1381. 2. Scholte, A. et al., (2011) subclinical left ventricular dysfunction and coronary atherosclerosis in asymptomatic patients with type 2 diabetes. Eur J Echocardiogr 12: 148-155. 3. Budoff, M.J. et al. (2006) Assessment of coronary artery disease by cardiac computed tomography. A statement from the American Heart Association Committee on Cardiovascular Imaging and Intervention, Council on Cardiovascular Radiology and Intervention, & Committee on Cardiac Imaging, Council on Clinical Cardiology. Circulation 114: 1761-1791. 4. Rumberger, J.A. et al., (1995) Coronary artery calcium areas by electron beam computed tomography and coronary atherosclerotic plaque area: a histopathologic correlative study. Circulation 92: 2157-2162. Acknowledgements: Dr F. Kazmi, Consultant Radiologist & Dr S. Mirsadraee, Consultant Radiologist, Chelsea and Westminster Hospital, for valuable feedback and help with data acquisition from PACS.