Monocyte Activation and Cardiac-MRI-Derived Vascular Dysfunction among Women with HIV

*co-first authors contributed equally  *co-senior authors contributed equally

Background
Women with HIV (WHIV) on ART face an increased risk of cardiovascular disease (CVD). Aortic vascular dysfunction, reflected by increased aortic pulse wave velocity (aPWV), presages, predicts, and promotes adverse CVD outcomes and is highly influenced by the local inflammatory milieu. Cognizant of sex-specific patterns of HIV-associated immune dysregulation, we compared aPWV among asymptomatic ART-treated women with HIV vs. women without HIV. We hypothesized that WHIV would evidence vascular dysfunction in association with monocyte activation.

Methods
In this prospectively recruited cross-sectional study, 20 asymptomatic WHIV on ART and 14 women without HIV completed cardiovascular magnetic resonance imaging as well as immune and metabolic phenotyping procedures. Aortic vascular function was quantified by measuring the aortic pulse wave velocity (Figure 1).

Figure 1. Assessment of aortic arch pulse wave velocity

Results
Aortic pulse wave velocity (aPWV) was significantly higher among WHIV vs. women without HIV (8.6 ± 1.3 m/s vs. 6.5 ± 1.3 m/s, P<0.0001; Figure 2).

Table 1. Baseline Demographics

<table>
<thead>
<tr>
<th>Covariate</th>
<th>WHIV (n=20)</th>
<th>Non-HIV-infected Women (n=14)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>57 ± 4</td>
<td>53 ± 6</td>
<td>0.61</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>32 ± 7</td>
<td>32 ± 7</td>
<td>0.73</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>129 ± 20</td>
<td>109 ± 26</td>
<td>0.06</td>
</tr>
<tr>
<td>Current smoking (%)</td>
<td>31 (16/20)</td>
<td>30 (9/24)</td>
<td>0.82</td>
</tr>
<tr>
<td>Total Cholesterol (mg/dL)</td>
<td>200 ± 41</td>
<td>203 ± 28</td>
<td>0.80</td>
</tr>
<tr>
<td>LDL Cholesterol</td>
<td>113 ± 33</td>
<td>109 ± 26</td>
<td>0.69</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>60 (10/20)</td>
<td>56 (10/20)</td>
<td>0.12</td>
</tr>
<tr>
<td>HIV viral load (copies/ml)</td>
<td>19 ± 18</td>
<td>19 ± 18</td>
<td>0.64</td>
</tr>
<tr>
<td>CD4+ T cell count (cells/mm³)</td>
<td>773 (526, 1202)</td>
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</tr>
</tbody>
</table>

Figure 2. Aortic pulse wave velocity among women with vs. without HIV

Solute CD163 (sCD163) was higher among WHIV vs. women without HIV (280 ± 293 ng/mL vs. 938 ± 308 ng/mL, P=0.005) and related directly to aPWV (r = 0.73, P = 0.0003; Figure 3). Among the whole group and among WHIV, aPWV related to extracellular volume – a measure of myocardial fibrosis (whole group: r=0.54, P=0.001; WHIV: r=0.47, P=0.04).

Figure 3. Relationship between aortic pulse wave velocity and monocyte activation

Conclusions
Asymptomatic ART-treated WHIV demonstrated increased aPWV. Among WHIV, aPWV related to heightened monocyte activation as well as downstream cardiac pathology (myocardial fibrosis). Additional studies are needed to identify targeted immune-modulatory therapies which slow the progression from vascular dysfunction to incident cardiac disease in this at-risk population.

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References