Background and Objectives

The Veterans Aging Cohort Study (VACS) Index has been shown to predict mortality, morbidity, and functional performance in people with HIV. Recent work from the CHARITÉ study has shown a cross-sectional association between the VACS Index and increased risk of neuropsychological impairments. This study examined the temporal association between the VACS index and neuropsychological functions and the potential clinical utility of the VACS Index for assessing HIV-associated Neuropsychological Disorders (HAND).

Methods

Study sample

We recruited 543 adults from two HIV outpatient clinics in Toronto, Canada (Table 1). Participants were predominantly men (76%) on antiretroviral therapy (85%), and had an undetectable plasma HIV viral load (70%) at baseline.

Measures

Neuropsychological functions

Neuropsychological (NP) assessments were conducted annually using a brief battery that included:

- Hopkins Verbal Learning Test–Revised
- Grooved Pegboard
- WAIS-R Digit Symbol test

Five neuropsychological NP measures were selected:

- HVLT-R total recall (correct responses)
- HVLT-R delayed recall (correct responses)
- Pegboard-dominant hand (seconds)
- Pegboard-non-dominant hand (seconds)
- Digit Symbol (correct responses)

VACS Index

The VACS Index was computed by summing pre-assigned risk points for age, CD4 count, plasma HIV viral load, hemoglobin, fibrosis, renal function, and HCV infection following guidelines. The VACS Index score ranged from 0 to 100 (mean=18.4 and median=16).

Statistical Analysis

Five raw NP measures were transformed into:

- Z scores (without demographic corrections), using the sample mean and standard deviation.
- Age, gender, race, and education-corrected T-scores using published norms.

Three different global NP function measures were created:

- Overall NP Z-score: Average of z-scores of the five NP measures
- Global T-score: Average of T-scores of the five NP measures (demographically corrected)
- Summary Regression-based Change Scores (RBCS): Average of residual regression scores of the five NP measures derived using standard regression-based (SRD) change score approach.

Linear regression modelling was used to examine the association between VACS Index score (at baseline) and change in NP functions over time, adjusting for baseline NP function and other covariates.

Findings

VACS Index score ranged from 0 to 100 (mean=18.4 and median=16).

Unadjusted analysis: Higher VACS Index score at baseline was associated with a decline in overall NP function over time (change in overall NP z-score: B= -0.06, p<0.001; change in HVLT-R z-score: B= -0.16, p<0.001; and change in global T-score: B= -0.04, p<0.001). This association persisted after adjustment for baseline NP performance, cognitive symptoms, depression, HIV disease markers, comorbidities, and demographic variables.

In adjusted analysis: Higher VACS Index score at baseline predicted a decline in overall NP function over time (change in overall NP z-score: B=-0.06, p<0.001; change in HVLT-R z-score: B=-0.16, p<0.001; and change in global T-score: B=-0.04, p<0.001). The VACS Index score also accounted for a considerable proportion (9%-17%) of the total variance explained by the regression models.

Conclusions

Our results replicate findings from the HNRC and suggest that neuropsychological performance is influenced by underlying physiologic injury.

Interventions to mitigate physiological injury (medical comorbidities) will likely improve neuropsychological functions.

Clinical measures collected as part of routine care may be useful in assessing and managing HIV-associated neuropsychological disorders (HAND).

The VACS index may be useful to identify and target those at higher risk for the development of HAND.