

The Effects of HIV and Hepatitis C Infection on Diffusion Tensor Imaging Measures

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Background

Hepatitis C virus (HCV) is a frequent co-infection with HIV (1, 2). Both can affect brain function raising the possibility of synergistic interactions. We utilized a brief neuropsychometric screen and diffusion tensor imaging (DTI) to investigate the relationship between neurological function and white matter integrity in mono (n=15) vs. co-infected (n=13) participants. We hypothesized greater microstructural abnormalities and neurocognitive impairment in co-infected vs. mono subjects.

Methods

Neuropsychometric assessment included trailmaking A/B and the digit symbol test (DST) (3). Raw scores were standardized into Z scores, and a composite neuropsychological (NPZ3) score constructed from the average of standardized values (3). DTI measures of fractional anisotropy (FA), mean diffusivity (MD) were obtained on a 3T Siemens scanner. All participants were taking antiretroviral therapy (ART) and were further subdivided into either mono or co-infected based on serum HCV antibody status. HIV status was characterized by CD4 cell count and plasma viral load. DTI indices were mapped to a common whole brain white matter skeleton for between-subject voxelwise analysis using Tract-Based Spatial Statistics (TBSS) (4). Regions-of-interest (ROI) corresponding to the cingulum and genu of the corpus callosum were selected based on previous studies (5) (Figure 1). Independent *t*-tests were utilized to assess possible differences in neuropsychometric and neuroimaging measures between mono and co-infected subjects.

Results

HIV+ subjects within the two groups did not differ in regards to sex (p=0.94) or education (p=0.77) but were dissimilar for age with co-infected subjects being older (p=0.001). On average co-infected participants were more impaired than mono-infected HIV+

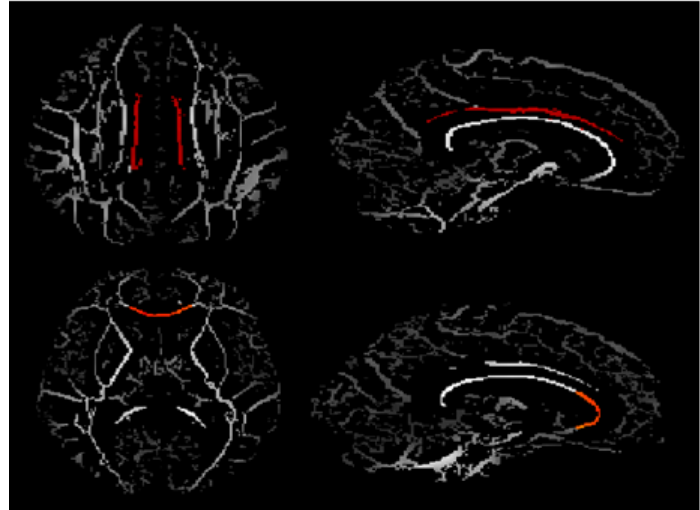


Fig. 1. Regions of interest were selected on the cingulum (top row) and genu of the corpus callosum (bottom row).

Table 1: Mean DTI indices in cingulum

	Co-infected HIV+	Mono-infected HIV+
FA	0.67	0.69
AD (x10 ⁻³ mm ² /sec)	1.26	1.32
MD (x10 ⁻³ mm ² /sec)	0.65	0.67

Table 2: Mean DTI indices in genu of corpus callosum

	Co-infected HIV+	Mono-infected HIV+
FA	0.86	0.85
AD (x10 ⁻³ mm ² /sec)	1.43	1.48
MD (x10 ⁻³ mm ² /sec)	0.59	0.62

References

1. Clifford, D et al, (2009) *Neurology*, 73(4):309-14.
2. Hinkin et al (2008), *J Addict Dis*, 27(2):11-17.
3. Martin-Thormeyer and Paul (2009) *Neuropsychol Rev.*, 19(2):215-231.
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5. Chen et al (2009) *Neuroimage* 47(4):1154-1162.

subjects on each neuropsychological test especially trailmaking B (p=0.01) and SDT (p=0.04). DTI values for MD were higher and AD were lower for co-infected HIV+ subjects but no significant differences were present for the two groups for each of the ROIs (Tables 1 and 2). No correlation existed between CD4 or HIV viral load and DTI measures or NPZ3 score.

Conclusions

The combination of HIV and HCV co-infection affected measures within the brief neurocognitive screening but not structural neuroimaging measures. Neither neuropsychological nor neuroimaging measures correlated with existing HIV serum markers. This lack of association may reflect relatively good virologic control by ART. Clinically significant neurocognitive dysfunction but not neuroimaging abnormalities maybe exacerbated by HCV infection in the setting of optimally treated HIV infection.