

# Evidence of brain damage in neuro asymptomatic HIV positive subjects kept on immune surveillance – A DTI study

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## Target Audience

Researchers working in the field of general medicine especially immunology and neuroimaging

## Introduction

CNS involvement occurs early in (Human Immuno deficiency Virus) HIV infection .<sup>1</sup> Abnormalities on MRI have been reported in 13% of neurologically asymptomatic subjects. HIV +ve patients with advanced disease and low CD4 counts have shown largest decrease in FA in the Corpus Callosum (CC) while the largest increase in MD in the subcortical white matter .<sup>2</sup> Few studies have reported DTI changes in neuroasymptomatic HIV positive individuals. We hypothesise that microstructural damage present in white matter tracts of patients without cognitive impairment will show reduced FA values which will correlate positively with CD4 counts.

## Materials and Methods

23 neuroasymptomatic subjects, 10 with CD4 count < 250, 13 with CD4 count > 250 and 13 seronegative controls were recruited. Conventional MRI and DTI data was acquired on a 3 Tesla MRI scanner (Magnetom Skyra Siemens). axial T2-weighted, axial T1-weighted, FLAIR, and DTI. DTI was acquired in transverse plane, using a high angular resolution echo planar sequence (TR = 8800 ms, TE = 95 ms, FOV = 230 mm<sup>2</sup>, 45 slices, slice thickness = 3 mm). The entire DTI sequence consisted of two averages of 45 axial slices, covering the whole brain, acquired with a b-value of 1000 s/mm<sup>2</sup> along 30 diffusion directions. Fibre assignment by continuous tracking (FACT) algorithm was used for reconstruction of fibres. Major white matter fibre tracts were generated and quantified by using in-house developed JAVA based software. Patients were divided into 2 groups based on IHDS scores of > 10 and < 10.

## Results and Discussion

We found reduction in anisotropy in CST, Anterior and Posterior Thalamic Radiation (ATR & PTR) in subjects with normal anisotropy values in the CC and normal appearing white matter on conventional MRI (Table 1) in patients with CD4 counts < 250. (Reduced anisotropy in CST was also noted in subjects with CD4>250). The MD values were however found to be unaffected in both subset of subjects viz a vis the controls. The largest decrease in anisotropy correlated positively with the largest decrease in CD4 counts indicating that FA is an important marker of HIV induced neuropathological insult to the white matter tracts.

Motor slowing subserves disease progression (5). In our study FA reduction in the CST was statistically significant in both groups ie those with CD4 < 250 (p=0.001) and those with CD4>250 (p= 0.005). 12 of these 23 subjects showed reduced psychomotor speed as tested by IHDS. As CST subserves motor function in the brain, the finding of reduced FA in CST in subjects with CD4>250 is suggestive of disease progression even when the infection severity is less.

**Conclusion:** DTI can be used as a neuroimaging marker to look for motor progression in HIV positive individuals on immune surveillance and may be even more sensitive than CD4 counts and thus can be used as a threshold for initiating HAART.

Table1 Group Means and SD from white matter tracts showing significant changes in Fractional Anisotropy of HIV positive subjects segregated according to CD4 counts and IHDS scores and age, sex and education matched controls

Fibres	Controls	HIV +ve	P value		P value		P value		
		CD4 < 250		CD4 > 250		IHDS <10		IHDS >10	
CC	0.468± 0.02	0.457 ± 0.02	0.251	0.469 ± 0.02	0.885	0.465 ± 0.02	0.761	0.463 ± 0.02	0.611
RPTR	0.403 ± 0.01	0.383 ± 0.01	<b>0.010</b>	0.395 ± 0.01	0.286	0.398 ± 0.01	0.590	0.386 ± 0.01	<b>0.016</b>
LPTR	0.405 ± 0.02	0.384 ± 0.01	<b>0.005</b>	0.396 ± 0.01	0.168	0.393 ± 0.007	0.137	0.390 ± 0.01	<b>0.025</b>
RCST	0.480 ± 0.01	0.456 ± 0.01	<b>0.001</b>	0.461 ± 0.01	<b>0.005</b>	0.464 ± 0.01	<b>0.036</b>	0.457 ± 0.01	<b>0.000</b>
LCST	0.477 ± 0.01	0.464 ± 0.01	0.117	0.460 ± 0.02	<b>0.023</b>	0.461 ± 0.01	<b>0.069</b>	0.462 ± 0.02	<b>0.041</b>
RATR	0.354 ± 0.01	0.341 ± 0.01	<b>0.014</b>	0.356 ± 0.01	0.762	0.350 ± 0.01	0.594	0.349 ± 0.01	0.347
LATR	0.346 ± 0.01	0.331 ± 0.01	<b>0.002</b>	0.350 ± 0.01	0.494	0.343 ± 0.01	0.633	0.341 ± 0.01	0.394

CST, cortico spinal tracts; ATR, anterior thalamic radiation; PTR, posterior thalamic radiation; CC, corpus callosum

## References

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