

Assessment of brain abnormalities in HIV infection by 3D Rosette Spectroscopic Imaging

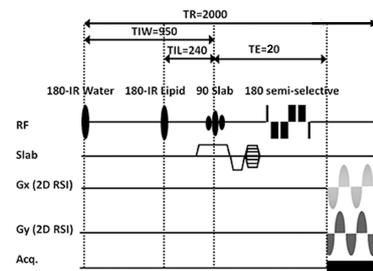
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Introduction

A recent quest for novel biomarkers for progression and treatment of HIV-associated neurocognitive disorder highlighted the potential of MRI/MRS¹⁻³. Recently, we validated fast 3D MRSI using rosette trajectories at 3 T using 48-mm slabs with regression analyses against the tissue GM fraction for the identification of neocortical abnormalities⁴. The purpose of this study was to assess metabolic abnormalities in HIV infection by MRSI covering brain cortex and parts of striatum.

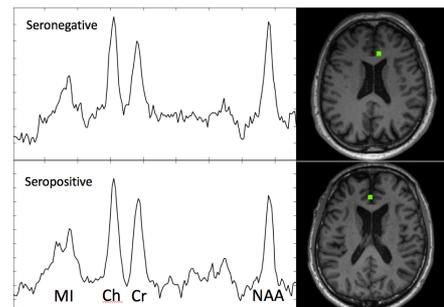
Methods

A group of 15 HIV seropositive subjects (in two age groups, <60 yo (n=8) and >60 yo (n=7)) and age-matched 29 seronegative controls (in two age groups, <60 yo (n=17) and >60 yo (n=12)) were evaluated using a Siemens 3 T Prisma scanner. The data was acquired using a fast rosette 3D MRSI sequence (9.6 min) using a FOV of 20 x 20 x 4.8 cm with 20x20x12 encodes across the FOV. The whole slab sequence was acquired using a non-selective IR for water suppression and a semi-selective refocusing pulse for water suppression with TE/TIR/TR = 20/240/2000 ms. The Cr/NAA, Ch/NAA, MI/Ch, MI/NAA, Ch/Cr and Glu/NAA peak ratios were evaluated for each of the MRSI voxels. Statistically significant changes in metabolite peak ratios in the patient brains were identified based on the regression statistics from the pooled seronegative controls in the age group corresponding to that of the patient. Linear regression analyses against a gray matter content were performed separately for each of 13 individual brain regions.



Results

Rostral anterior cingulate cortex showed a statistically significant increase in the MI/NAA ratio in older seropositive subjects in comparison to their age matched controls (Cohen's $d = 1.24$). It was accompanied by an increase in Cr/NAA ($d = 0.94$), which, however, did not reach statistical significance. The Ch/NAA and Ch/Cr ratios showed more disseminated increases in younger seropositive subjects in comparison to their age matched control group (d between 0.8-1.3 in regions with significant differences). Typical rostral anterior cingulate spectra (from the voxels labeled in green) are shown in the figure; CRLB of the fits for peaks of interest were 4-9%.



Discussion

The increase in MI and Cho and corresponding decrease in NAA may indicate neuroinflammation and neuronal injury occurring across the brain, in particular, in parts of its limbic system associated with cognitive function and memory (cingulate cortex).

Conclusion

Fast MRSI enables the detection of subtle metabolic abnormalities at clinically acceptable scan times (<10 min) at 3 T. It may be a useful complementary tool in monitoring disease progression and response to therapy.

References

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