RELATIONSHIP BETWEEN AMYLOID LOAD, WHITE MATTER MICROSTRUCTURE AND COGNITIVE PERFORMANCE IN PATIENTS WITH SIGNIFICANT WHITE MATTER DISEASE

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Background

- White matter hyperintensities (WMH) is thought to contribute to cognitive impairment [1,2]
- WMH may reflect demyelination or vasogenic edema
- Non-specific WM binding of 18F-Florbetapir may depend on the myelination status of the WM tracts

Objective

To determine if amyloid deposition in WM is associated with diffusion tensor imaging (DTI) changes in a population with significant WMH

Methods

- Patients: 45 patients & 45 ADNI normal controls
- Measures: 3T MRI including DTI, 18F-Florbetapir PET/CT, and MMSE
- Computed Standardized uptake value ratios (SUVr) normalized to the pons
- Fractional anisotropy (FA) and mean diffusivity (MD) were normalized by whole brain FA/MD
- Multiple linear regression and partial correlations, adjusting for age, between PET, DTI and WMH metrics
- Corrected for multiple comparisons using FDR

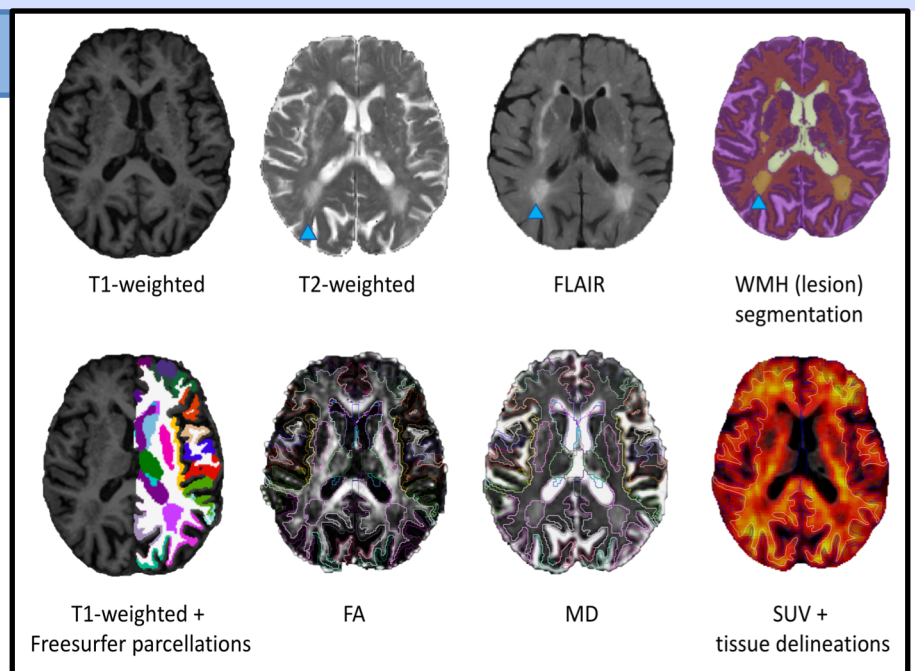
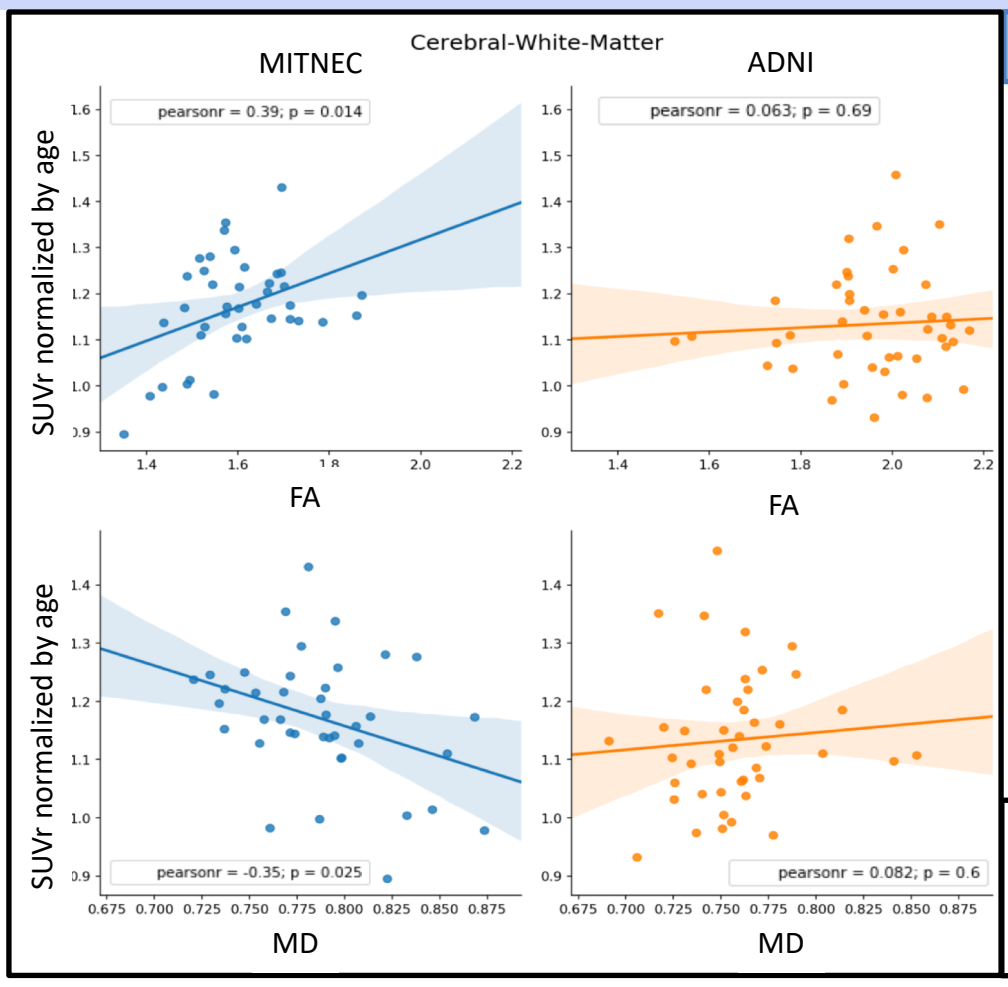


Figure 1. WMH segmentation with the *LesionExplorer*[3] pipeline using T1, T2 & FLAIR. *Freesurfer*[4] segmentation, FA, MD, and PET SUV.

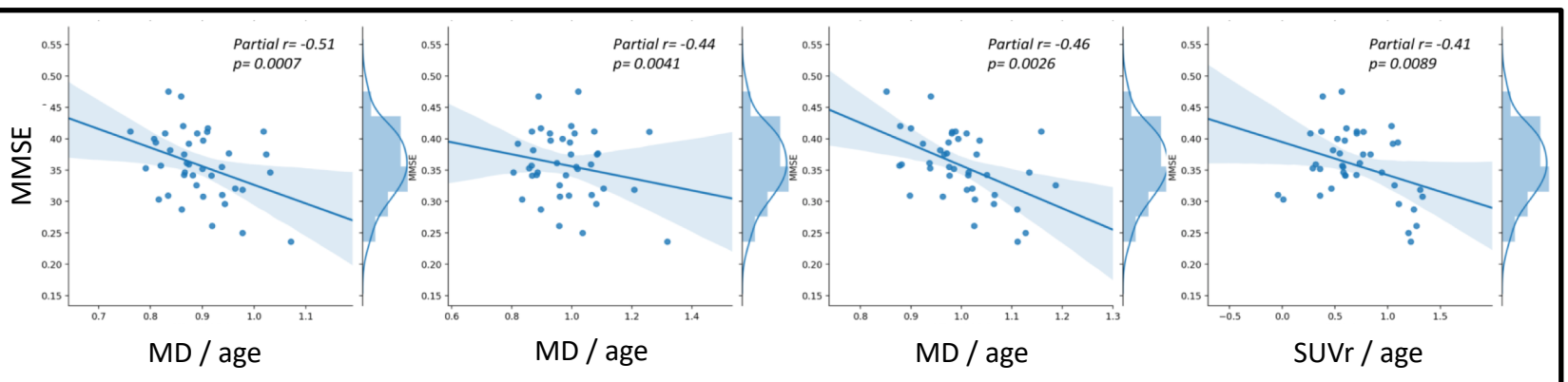


Results

- WM amyloid load correlated with FA (r=0.39) & inversely correlated with MD (r=-0.35) in high WMH load patients but not in ADNI controls
- NAWM FA predicted WMH volumes (B=-5.7e04, $p < 0.001$)
- Normalized FA was decreased and MD increased for high WMH volumes patients compared to controls ($p < 0.0001$, $p < 0.001$)
- MMSE was negatively correlated with MD in the left medial temporal regions & SUVr in the left paracentral gyrus ($r > -0.40$)

Figure 2. Partial correlations of AV-45 SUVr and normalized DTI metrics, adjusting for age, in the cerebral white matter for both patient populations.

Figure 3. MMSE partial correlations with imaging : MD in the left medial temporal lobe and precuneus cortex, and SUVr in the paracentral gyrus.



Conclusion

Non-specific WM amyloid binding may reflect microstructural integrity (myelination status) in patients with high WMH load. Future work to analyze involved WM networks & GM uptake.

References

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