Tau PET in subjects at risk for chronic traumatic encephalopathy

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Background: Chronic traumatic encephalopathy (CTE) is a progressive tauopathy resulting from repetitive brain trauma. Tau deposition is widely scattered in neocortical sulci, but by Stage III, medial temporal lobe (MTL) is typically involved. We tested whether MTL tau PET measures were elevated in 10 former American football players with histories of multiple trauma exposure (TE) compared to non-exposed control subjects (CS).

Methods: TE (n=10, aged 45.2 ± 8.7y; 10.4 ± 2.8 football seasons played) and CS (n=10, aged 49.4 ± 7.1y) participants underwent clinical evaluations, MRI, ^{18}F Flortaucipir (FTP)-PET, and PiB-PET. Group differences in FTP SUVR (80-100min) defined individually in 4 MTL ROIs (Freesurfer) were assessed with robust linear regression, adjusting for age.

Results: TE and CS groups were similar in age, education, MMSE, ICV-adjusted total hippocampal volume, and amyloid burden assessed with PiB FLR (all $p > 0.2$), but differed in Ohio State Traumatic Brain Injury score ($p < 0.05$). FTP SUVR was greater in TE compared to CS in parahippocampal gyrus and hippocampus ($p < 0.05$) and at trend level in entorhinal cortex and amygdala ($p < 0.07$) (Figure 1). Age by group interaction was seen in parahippocampal gyrus ($p < 0.01$, CTE>CS), and trending in entorhinal cortex ($p < 0.1$).

Conclusions: These preliminary data suggest that PET measures of tau deposition in MTL may be elevated in individuals with a history of repeated brain trauma, consistent with postmortem observations. While the binding properties of FTP to cortical CTE lesions are at present incompletely understood, our data are consistent with autopsy data in CTE that indicate greater MTL tauopathy than expected for age. While these trauma-exposed participants were nondemented, further evaluations of tau PET in relation to features of putative CTE clinical phenotypes may yield important insights.