

Amyloid-beta pathology modifies iron–cognition associations in mild cognitive impairment: a QSM and PET study

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Objective

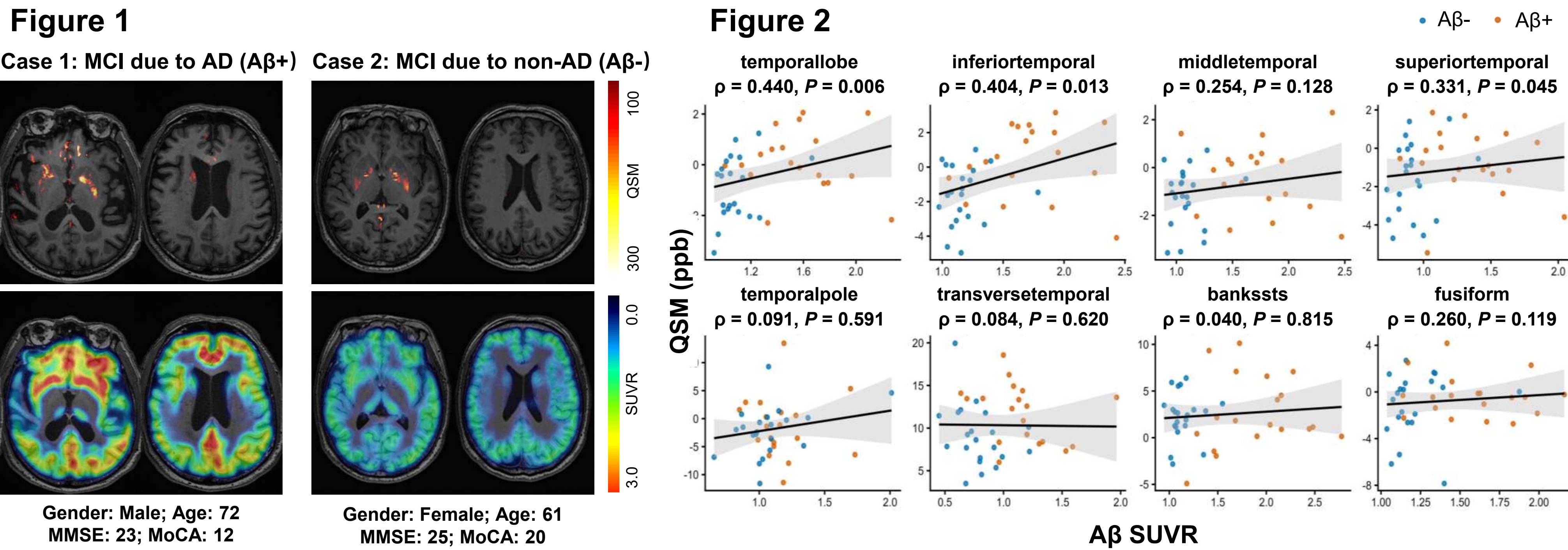
- To characterize regional brain iron distribution using quantitative susceptibility mapping (QSM).
- To investigate whether the impact of iron on cognitive function is Aβ-dependent in patients with mild cognitive impairment (MCI).

Methods

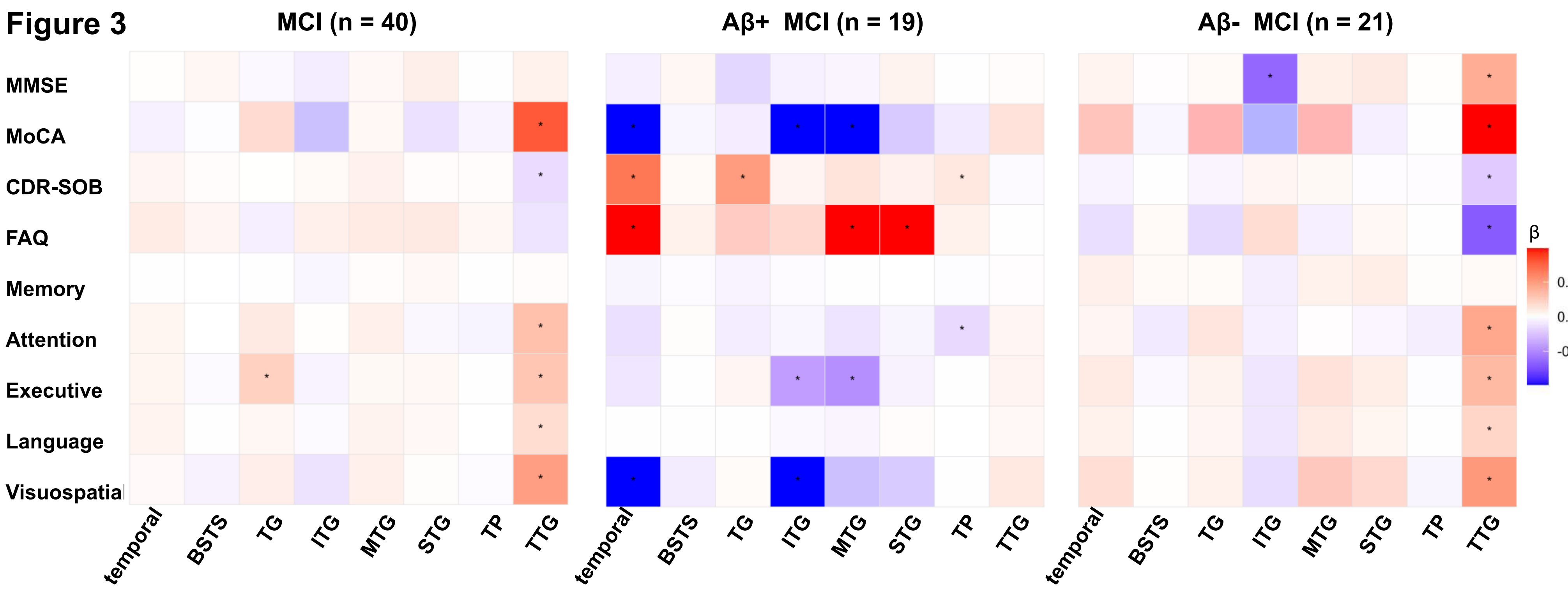
Based on the Shanghai Memory Study (SMS), 40 patients with MCI were enrolled and stratified into Aβ-positive (Aβ+, n=19) and Aβ- (n=21) groups based on visual assessment of Aβ-PET imaging. All participants underwent QSM, Aβ-PET, and neuropsychological assessments.

Results

- Aβ+ MCI showed higher mean temporal lobe susceptibility (P=0.010), with the largest differences observed in the inferior temporal (P=0.001) and transverse temporal gyri (P=0.022, Figure 1).
- After adjustment for age, sex, and education, mean temporal lobe susceptibility was positively correlated with Aβ-PET SUVR (ρ=0.44, P=0.006), with the inferior temporal gyrus showing the strongest association (ρ=0.40, P=0.013, Figure 2).



- In the Aβ+ group, elevated iron load in the inferior temporal gyrus was correlated with lower MoCA scores and poorer executive and visuospatial performance. No such correlations were observed in the Aβ- group (Figure 3).



Conclusion

- Temporal iron deposition in MCI is associated with Aβ pathology.
- In Aβ-positive MCI, higher inferior temporal iron load was associated with poorer cognitive performance.
- Integrating QSM with Aβ-PET has the potential to inform biologically defined stratification and personalized clinical management of MCI.

Keywords
Iron
Amyloid-beta
Mild cognitive impairment
Quantitative susceptibility mapping
Inferior temporal gyrus