

Gray matter atrophy but not vascular brain injury is related to cognitive impairment in patients with heart failure

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Background: Cognitive impairment in heart failure (HF) interferes with the capacity to self-care and is associated with adverse health outcomes. This underlines the importance of detecting the extent and nature of cognitive impairment in HF. We report on the presence and mutual association of neuroimaging markers and cognitive impairment in patients with HF.

Method: We included 147 patients with HF (69±10yrs; 32%F; MMSE 29±1) and 121 reference participants (66±8yrs; 46%F; MMSE 29±1) from the Dutch multicenter Heart-Brain study. Brain MRI scans were rated for (lacunar) infarcts and microbleeds. Total grey and white matter volume, hippocampal volume and white matter hyperintensity (WMH) volume were calculated. We used a standardized neuropsychological test battery to measure cognition and calculated compound z-scores for each cognitive domain. Associations between neuroimaging markers and cognitive functioning were investigated using linear regression analyses, with separate models for each cognitive domain. We adjusted for participant group, age, sex and education. To investigate whether associations differed according to participant group, interaction terms were included in our analyses.

Result: Patients with HF had lower total grey matter volume and more vascular brain injury compared to the reference group, including WMH (median (interquartile range) 1.7 (40) versus 0.6 (1.8), $p<0.001$), (sub-)cortical infarcts (13% versus 3%, $p<0.01$) and lacunar infarcts (28% versus 10%, $p<0.001$). Cognitive impairment was found in 18% of HF, most often in the domains of memory and attention/psychomotor speed. Overall, we found associations between smaller total grey matter volume and worse global cognition, more cortical and lacunar infarcts (standardized beta [$st\beta$] = -0.14 – 0.56 , $p<0.05$). Stratification for participant group showed associations between worse global cognition and smaller total ($st\beta=0.43$, $p<0.01$) and hippocampal ($st\beta=0.22$, $p<0.05$) grey matter volumes in HF. We found no association between cognition and vascular brain injury.

Conclusion: Patients with HF exhibit cognitive deficits more pronounced in the domains of memory and attention/psychomotor speed. Grey matter atrophy, but not vascular brain injury seems to be related to cognitive impairment in HF.