Exploratory analysis of the dietary influence on MRI-detected iron deposition in brains of older individuals

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Abstract:

Introduction: Brain Iron Deposits (IDs) are associated with neurodegenerative diseases and impaired cognitive function in later life [1], but their cause is unknown. Animal studies have found a relationship between dietary iron, calorie and cholesterol intake and brain iron accumulation [2]. We investigate the relationship between daily dietary parameters, blood indicators of iron status, and brain IDs in humans.

Subjects and Methods: From a cohort of 1063 community-dwelling older individuals born in 1936 (mean age 72.7years, SD=0.7), 700 underwent brain MRI at a GE_Signa-1.5T scanner. T2*- and T1-weighted were used to automatically assess regional volumes of brain IDs in the basal ganglia [3]. IDs in the brainstem, white matter, thalamus, and cortex/border with the corticomedullary junction were separately assessed, all of which were followed by individual checking/correction if needed. Haemoglobin, red cell count, haematocrit and mean cell volume were obtained from blood samples. Typical daily intake of iron, calories, saturated fats, polyunsaturated fatty acids and cholesterol were estimated from a validated frequency-food questionnaire [4].

Results: Overall, 72.8% of the sample with valid MRI had brain IDs (n=492/676). The median total volume of IDs was 40(IQR=195.5) mm^3 Basal ganglia IDs, with median volume of 35(IQR=159.5) mm^3, were found in 70.6% of the sample. IDs in the brainstem were found in 12.9% of the sample, in the cortex in 1.9%, in the white matter in 6.1%, and in the thalamus in 1.0%. IDs in the white matter (microbleeds and minor haemorrhages) were associated with dietary cholesterol (ρ=0.09;*P*=0.035). Total volume of IDs was

negatively associated with haemoglobin (ρ=-0.12;*P*=0.02), haematocrit (ρ=-0.11;*P*=0.03), and red cell count (ρ=-0.13;*P*=0.009). Red cell count was associated with total dietary iron intake (ρ=0.067;*P*=0.048), calorie intake (ρ=0.093;*P*=0.006), saturated fats (ρ=0.119;*P*<0.001), and cholesterol intake (ρ=0.069;*P*=0.042). Mean cell volume was negatively associated with saturated fats (ρ=-0.072;*P*=0.03) and polyunsaturated fatty acids (ρ=-0.065;*P*=0.05).

Discussion/Conclusion: Our results suggest that cholesterol and saturated fats intake but not iron or overall caloric intake are associated with IDs in the human brain. Further work is required to corroborate our findings on other samples and, if results are consistent, investigate the underlying mechanisms.

References:

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