Is cognitive decline associated with progression of white matter hyperintensities in normal ageing? A longitudinal brain MRI study in the 1921 Aberdeen Birth Cohort.

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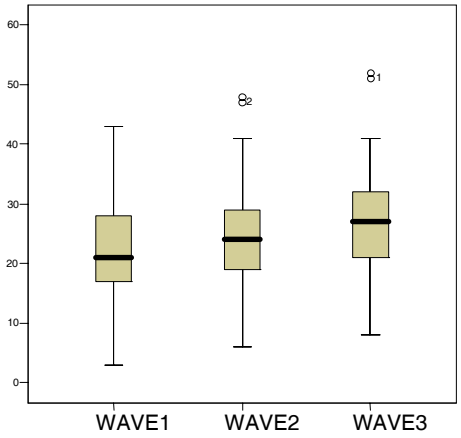
PURPOSE: To investigate the relationship between brain white matter hyperintensities (WMH) on T2- weighted magnetic resonance imaging (MRI) and cognitive decline in a well-characterized sample of healthy old people, whose intelligence was recorded at 11 years of age (1).

MATERIALS AND METHODS: 107 (58% male) participants were recruited from the larger 1921 Aberdeen Birth Cohort (N=283), a longitudinal study of cognitive ageing and health. Inclusion criteria for MRI were absence of a history of neurological disease, such as Parkinson's disease or stroke, mini-mental state examination (MMSE) score >24 and absence of contra-indications to MRI. Brain MRI was carried out on a 1.0T Siemens Magnetom Impact (Erlangen, Germany) in 107 participants at baseline (wave 1), in 80 participants after 1 year (wave 2) and in 57 participants after 2 years (wave 3). All participants had detailed neuropsychological assessment using a battery of tests, which measured both fluid and crystallized abilities, on 3 occasions, corresponding with MRI acquisition (1). Fluid intelligence, the ability to deal with novel information and problem solve, was assessed using Raven's Progressive Matrices (RPM), Digit Symbol (DS) and Block Design (BD). Crystallised intelligence, which usually remains stable during adult life, was assessed using the National Adult Reading Test (NART). Periventricular and deep WMH severity on MRI images were rated using the Schelten's scale (2). Differences in Schelten's scores between waves 1 and 2, between waves 2 and 3 and between waves 1 and 3 were recorded. Relationships between change in WMH scores and change in neuropsychological test variables analysed using Pearson correlations, t- test and General linear modelling (univariate analysis of variance).

RESULTS: Progression in white matter hyperintensitis (WMH) scores on MRI was significant over the 3 waves with mean and standard deviation in wave 1 being (24.4 $\pm$ 8.9), wave 2 (25.3 $\pm$9.3) and wave 3 (27.0 $\pm$8.9)(Figure 1). Rating scores in each group were normally distributed and correlated with each between waves 1 and 2, 2 and 3 and 1 and 3. Progression of Schelten's scores correlated with lower current RPM scores ($P<0.05$). In addition there was a tendency towards significance between Schelten's scores and DS and BD scores ($P<0.1$).



(Figure 1: Box plot of 3 waves of WMH in normal ageing)

CONCLUSIONS: Longitudinal study of brain MRI acquired at 3 annual intervals demonstrates that WMH progress and progression correlates significantly with performance on RPM, DS and BD, all tests of fluid intelligence. No significant correlation was found between WMH scores and NART scores (a measure of crystallized intelligence). These longitudinal analyses confirm those of our previous cross sectional study (3).

References:

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