

Gadolinium retention in the brain – an MRI relaxometry study comparing linear and macrocyclic types of gadolinium based contrast agents

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Syfte: Gadolinium contrast agents (GBCAs) have been shown to be retained in the brain after multiple linear GBCA administrations. We aimed to quantitatively investigate T1- (R1) and T2-relaxation rates (R2) in different brain structures in relation to linear and macrocyclic GBCA-administrations by relaxometry, as well as explore possible associations to cognitive dysfunction.

Material och metoder: 86 MS patients who had received different types of GBCAs, were consecutively recruited, to perform quantitative MRI during their MRI-follow-up. Manual segmentations of dentate nucleus, globus pallidus, caudate nucleus and thalamus, were performed. R1- and R2-values from each region were extracted by overlapping the segmentations with the quantitative relaxation maps. Multiple linear regression was performed to investigate associations with the number and type of administered GBCA. 27 patients had performed neuropsychological testing. Possible associations between cognition and the relaxation values were then explored with regression models.

Resultat: This study showed that exposure of GBCA leads to shorter R1- and in some degree even R2-values after multiple administrations of linear GBCA, but not in patients who had received macrocyclic types of GBCA. This is in line with previous studies using semi-quantitatively methods. MS-patients receiving GBCA have also higher relaxation values in comparison to healthy controls. Lower relaxation rates in the studied brain structures (except globus pallidus) are statistically associated with lower information processing speed.

Konklusion: Linear, but not macrocyclic, types of GBCA are associated with larger R1 and R2. Although higher R1 in turn are associated with lower information processing speed, no conclusion regarding causality can be confidently established, as the MS-disease have too many confounders related to the cognitive outcome variable.