

IS QSM A METAL QUANTIFICATION TOOL IN THE HUMAN BRAIN?

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Several neurodegenerative diseases have been associated to metal accumulation in the brain, e.g. iron in the basal ganglia of patients with Parkinson's disease, copper in patients with Wilson's disease. Measurement of the metal content is a hard task in vivo. Some indirect quantification techniques based on Magnetic Resonance Imaging (MRI) have been proposed. Quantitative susceptibility mapping (QSM) maps the tendency of the tissue to be magnetized by an applied magnetic field. Postmortem brain studies involving biochemical and histochemical experiments have shown that susceptibility values correlate linearly with total iron. It is well known that ferritin is the major iron storage protein in the normal tissue. Taking into account both evidences, it is predictable that these quantitative MRI values must be totally influenced by the ferritin concentration. However, experimental evidences of this relationship for ionic iron in specific sites have not been reported yet. Moreover, the influence of other metals (Cu, Zn, and Al) on susceptibility values is not a closed question.

Electron Paramagnetic Resonance (EPR) is an excellent spectroscopic technique to quantify paramagnetic ions and to obtain information about the electronic structure of the paramagnetic centers. In this talk, we will discuss the relationship between susceptibility values obtained from MRI and metal composition from other techniques (EPR and Mass Spectrometry) in postmortem brains.