

MRI OF MYELIN AS A POTENTIAL TOOL FOR EARLY DIAGNOSIS OF MULTIPLE SCLEROSIS

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It is well-known that changes in myelin are associated with development of multiple sclerosis. Potentially, these changes could be detected with MRI, yet, despite many efforts, there is no well-established MRI method that would provide precise enough information that would allow detection of myelin alteration that can indicate an onset of MS. The major obstacle in myelin detection is its very short relaxation times, in particular T₂, that makes it invisible in conventional MRI. Nevertheless variations in T₂ may also be an indicator of small changes in myelin structure. The measurements of myelin T₂ are particularly difficult at higher magnetic fields due to shortening of T₂ with the increasing field strength. This is particularly important as recently introduced human systems reached 7T. Therefore we applied and evaluated various new MRI techniques enabling detection of changes in T₂ of myelin at 9.4T in mouse brain in vivo. In particular we applied a modified inversion recovery ultra-short echo time (IR-UTE) pulse sequence and optimized its parameters. A superconductive RF coil was used to obtain sufficient signal-to-noise ratio. This arrangement allowed to obtain high resolution images (100 μ m \times 100 μ m) and to quantify T₂ and T₁ components of the brain structures with different myelin content. The proposed method may be important in early diagnosis myelin related brain pathologies such as MS and other neurogenerative diseases.