**Comparison of the Myelin Related Proton Pool and the MTR**

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## Introduction:

Imaging of the magnetization transfer ratio (MTR) has become a very sensitive method to study disease related tissue changes in multiple sclerosis (MS). However, the MTR reflects a complex combination of tissue and pulse sequence related parameters which limits its pathological specificity (1). We recently have developed a new method which allows to measure the fractional pool size (FPS) of bound protons which is the relative number of protons bound to myelin lipids and proteins (2). Based on the assumption that the fractional pool size represents the degree of demyelination we compared FPS data with conventional MTR measurements.

## Material and Methods:

In addition to conventional imaging, MTR and FPS imaging was performed in 17 patients suffering from early remitting relapsing MS (12 female, 5 male, mean age 31 years, mean EDSS 1.4). MTR maps were obtained with a FastPACE sequence performed with and without a binomial saturation pulse (3). The FPS was determined with a method that is based on spin labeling with a STEAM preparation scheme and on the principle of indicator dilution theory (TE/2 = 5 ms, TR = 2 s, TM = 300 ms) (2). To improve the intrinsically low signal to noise ratio provided by this method we had extended the original sequence with an echo reset pulse, followed by a fast HASTE readout with 4.5 ms echospacing (Fig.1). Modulus averaging of 64 acquisitions was done offline to reduce motion induced artifacts. FPS imaging was done in a single slice along the callosal plane or, alternatively, at the level of the centrum semiovale. Regions in normal appearing white matter and different types of MS lesions were analyzed.

## Results:

The MTR values from the most destructive lesions to normal appearing white matter ranged from 32.3 % to 54.8%, while the FPS ranged from 5.1 % to 16 %. There was a significant correlation between the MTR and FPS (Fig.2). Interestingly, in the high MTR range there can be an two or three fold difference in the FPS. This may reflect that the FPS is more sensitive but also that these lesions show more than a simple demyelination.

## Conclusions:

Our results confirm that the MTR is related to the macromolecular content, but that also other factors may strongly influence the MTR. Compared to the MTR, the FPS seems to be a more accurate and sensitive measure for demyelination.

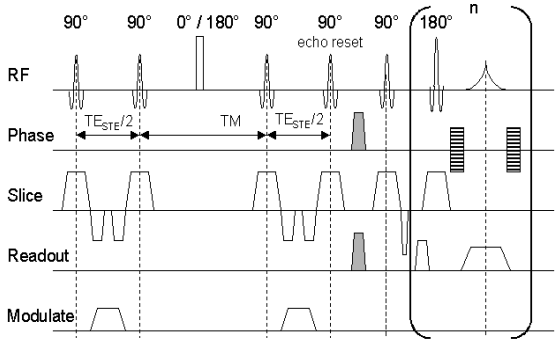


**FIG.1.** Sequence for depicting the fractional pool size. The STEAM preparation is followed by an echo reset pulse and a HASTE readout. For details see ref (2).

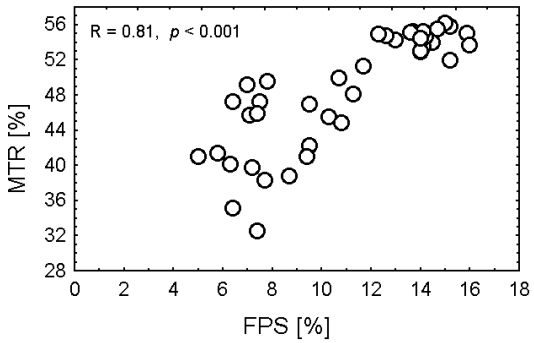


**FIG.2**.

## References:

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