Advantages of Fast Recovery Variant for T2-Weighted Fast Spin-Echo Imaging of the Brain

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Purpose
Fast recovery fast spin-echo (FRFSE) is a new pulse sequence using a driven equilibrium pulse to convert residual transverse magnetization into longitudinal magnetization and has demonstrated improvements in T2-weighted imaging for the spine (1) and the temporal bone (2) predominately related to improvements in fluid contrast. Its possible value for brain imaging has not been tested and the purpose of this study is to perform a quantitative comparison of FRFSE against standard FSE in brain scans of normal volunteers.

Materials & Methods
Six sessions were performed on normal volunteers on a General Electric 1.5 T system. At a fixed TR of 4000 msec, a series of scans was performed using TEs of 110, 90, 70, 50, 30 msec. Parameters including total scan time were kept identical for FRFSE and FSE scans. Region of interest measurements were performed of the gray matter (GM), white matter (WM), cerebral spinal fluid (CSF), and air. SNR and contrast ratios were calculated.

Results
At the same TE, it was found that the FRFSE images had significantly greater T2 contrast. This was most apparent in the higher CSF/WM (average 56% gain) and CSF/GM (average 68% gain) contrast ratios, but also seen in the GM/WM (average 5% gain) contrast ratio. SNR of the CSF also was improved greatly (average 30% gain). On the other hand, FRFSE images had lower SNR in the brain parenchyma: GM SNR 4% less and WM 6% less. Of perhaps more practical interest, it was found that shorter TEs on FRFSE scans delivered similar "T2 weighting" as longer TEs on standard FSE scans, but at a significant improvement in GM and WM SNR (average of 15%).

Conclusion
This preliminary test on normal subjects shows that FRFSE may be helpful in T2-weighted brain imaging by effectively increasing the degree of T2 weighting and allowing the use of shorter TEs thus yielding improved SNR for a given scan time. While
the effects within the parenchyma are not as dramatic as that of the CSF, this new pulse sequence merits further evaluation for possible use in routine clinical imaging.

References