PROPELLER-MR For Diffusion-Weighted Imaging in Regions of Magnetic Field Inhomogeneity: Brain and Cervical Spinal Cord

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Purpose
To study the ability of periodically rotated overlapping parallel lines with enhanced reconstruction (PROPELLER) multishot fast spin-echo MR imaging (1) to provide diagnostic diffusion-weighted imaging (DWI) of the brain in regions of field inhomogeneity as well as in cervical spinal cord, and to compare values of apparent diffusion coefficient (ADC) obtained with this technique to those obtained with conventional single-shot echo-planar DWI.

Materials & Methods
Nine adult patients, four of whom were known or suspected to have paramagnetic sources of intracranial magnetic field inhomogeneity or pathology near the skull base, underwent DW-PROPELLER in addition to routine DW EPI (b = 0, 1000 sec/mm²). Mean ADC values were obtained for regions of interest (ROIs) in several anatomical structures and compared between the two techniques. DW-PROPELLER also was compared with DW EPI in the cervical cord of two normal volunteers.

Results
In all regions where field homogeneity was poor, including in the vicinity of two intracranial aneurysm clips, an extracranial metallic foreign body, and a hemosiderin-stained resection cavity, DW-PROPELLER provided diagnostic images with less distortion and greater anatomical detail than DW EPI, within a reasonable scan time (4:39 for a 16 slice, full-tensor acquisition). With somewhat longer but still reasonable scan times (8:00), DW-PROPELLER also provided full-tensor, diagnostic DWI of the cervical cord (Figure) with less distortion than DW EPI. ADC values differed by an average of 5% between the two techniques in regions unaffected by susceptibility artifacts, including the cervical cord.
Conclusion
PROPELLER provides high-quality DWI with less distortion and greater anatomical detail than DW EPI in regions of field inhomogeneity within a reasonable scan time. It also can provide diagnostic, full-tensor DWI of the cervical cord.

References