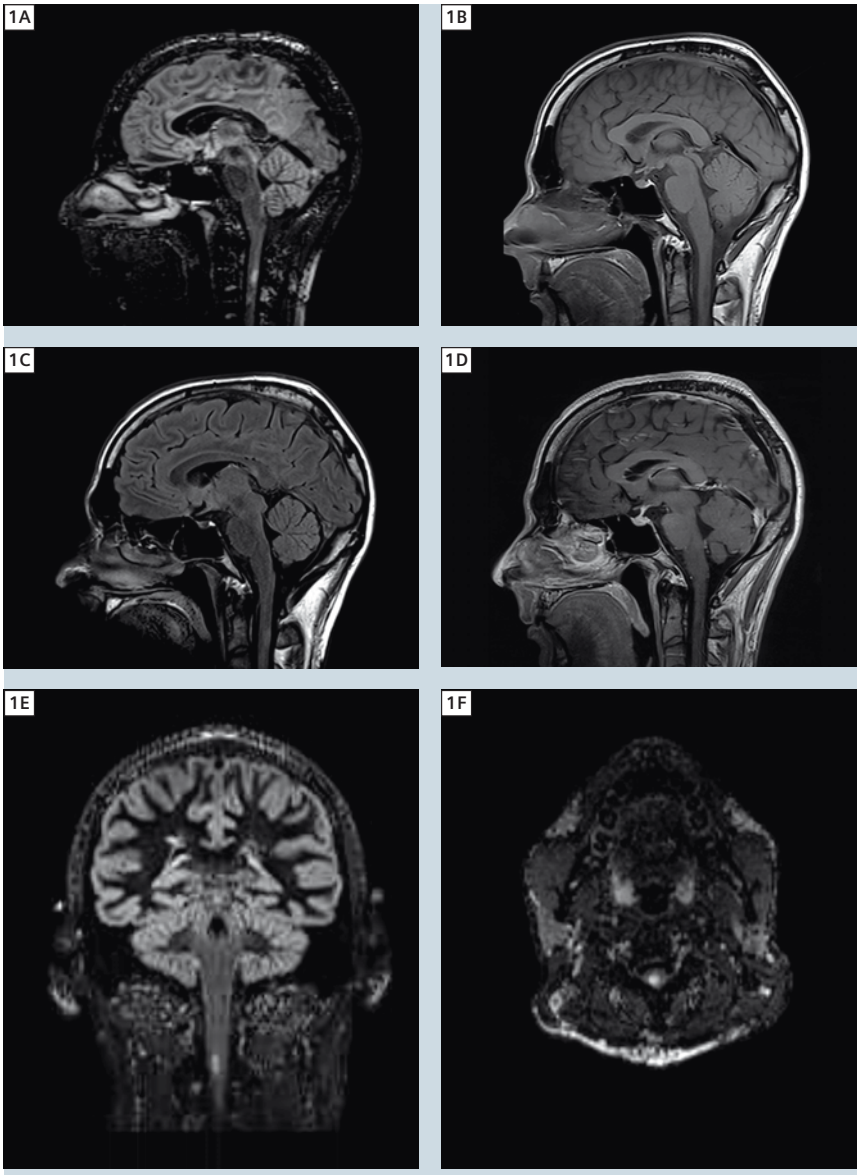
Case Report:
Cervical Spine 3D Double Inversion Recovery (DIR) in Demyelination

David Shipp

Monash Medical Centre, Clayton, Australia



1 SPACE DIR **(1A)** and corresponding sagittal T1w image **(1B)**, FLAIR **(1C)**, post contrast T1w image **(1D)**, coronal **(1E)** and transversal MPR of the SPACE DIR **(1F)**.

Introduction

The Double Inversion Recovery (DIR) sequence* is beginning to be widely accepted in brain MRI examinations to display multiple sclerosis (MS) plaques [1]. DIR employs two inversion times (TI); in our case the 3T MAGNETOM Verio works in progress (WIP) sequence uses one fixed TI of 450 ms, and an adjustable TI of 3000 ms, resulting in suppression of the signal from white matter and cerebrospinal fluid (CSF) leading to increased conspicuity for white matter lesions. Thus far the sequence has been essentially confined to use in the brain. We recently investigated extending the technique into the cervical spine.

Patient history

Case 1

A 32-year-old male referred with possible MS underwent DIR of the brain which included the upper cervical cord within the field-of-view. An upper cervical cord lesion is well appreciated (Fig. 1).

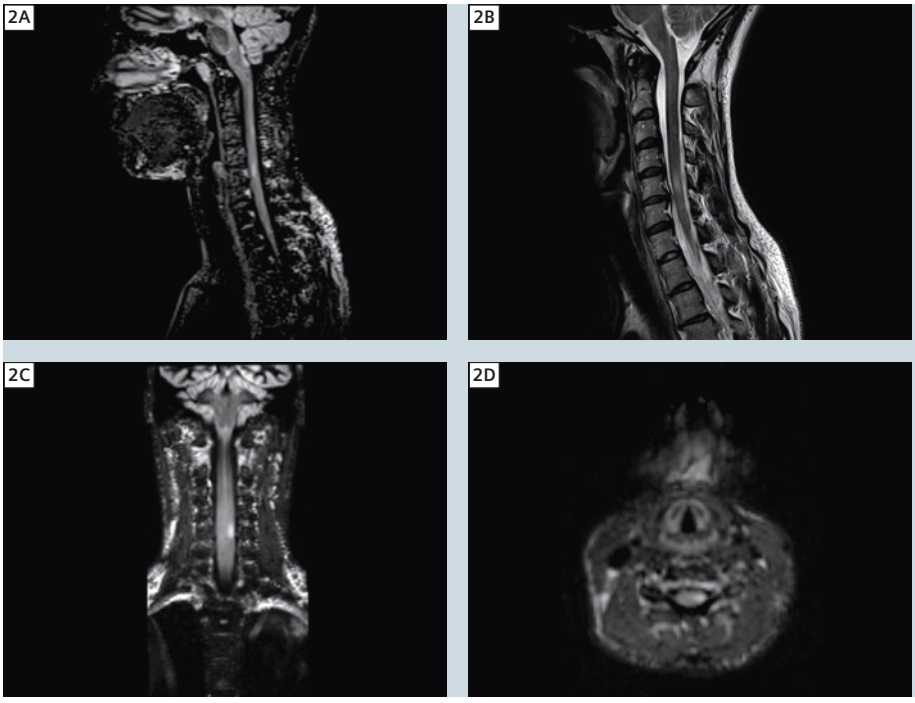
Case 2

A 37-year-old female for an annual review post immune therapy for optic neuritis and MS. Dedicated cervical spine DIR was performed (Fig. 2).

Sequence details

Images obtained utilizing a Siemens 3T MAGNETOM Verio with the Head and

*WIP – Works in progress. This information about this product is preliminary. The product is under development and not commercially available in the U.S., and its future availability cannot be ensured.



2 SPACE DIR **(2A)** and corresponding T2w image **(2B)** in sagittal orientation. Coronal **(2C)** and transversal **(2D)** MPR of the SPACE DIR.

Neck Matrix coil combination. Sequence parameters for 3D sagittal DIR:
TR 7500 ms, TE 325 ms, 1.5 mm isotropic voxel size, TI of 3000 ms, iPAT factor 2, 100 % slice oversampling (to reduce the likelihood of aliasing involving the shoulders), scan time 7 min 39 sec. Axial and coronal multiplanar reconstructions (MPR) post processing.

Imaging findings

Case 1

The 3D sagittal DIR demonstrates a lesion at the level of C2 consistent with a demyelination plaque (Fig. 1A). Comparing the lesion's appearance on the other sagittal sequences performed; T1 (Fig. 1B), T2 FLAIR (Fig. 1C) and T1 SPACE post-contrast (Fig. 1D) the lesion is most conspicuous on the sagittal DIR. The DIR MPRs further increase diagnostic confidence (Fig. 1E coronal 2 mm MPR, Fig. 1F axial 2 mm MPR).

Case 2

3D sagittal DIR demonstrates a lesion at the level of C5 on the left (Fig. 2A); a new lesion from previous MR exams. Comparison between the sagittal T2 (Fig. 2B) and the 3D sagittal DIR demonstrates relative increased conspicuity on the DIR sequence. MPRs were again employed (Figs. 2C, D coronal and axial).

Discussion

Where the clinical query is MS and in the monitoring of established MS cases the sagittal 3D DIR WIP sequence has proven helpful. Based on these experiences we are sure that the sequence will find its way into clinical routine for brain MR exams.

Early promising results in the cervical cord have been seen whether this has been when combined with brain visualization (e.g. case 1) or with dedicated cervical cord imaging (e.g. case 2). Demyelination plaques may be challenging to visualize on T2-weighted imaging alone as the lesions are often adjacent to CSF. The DIR sequence results in high lesion to background signal in the cord, CSF suppression and the ability to review multiple planes resulting in apparent more confident lesion detection in this case series warranting further evaluation. We are now progressing to a formal pilot evaluation in a larger case series.

Reference

1 J.J.G. Geurts at al.,Consensus recommendations for MS cortical lesion scoring using double inversion recovery MRI. Neurology 76, February 2011.

Contact
David Shipp
MRI Supervisor
Monash Medical Centre
Clayton
Australia
Phone: +61 9594 2014
Fax: +61 9594 6009
David.Shipp@southernhealth.org.au

*WIP – Works in progress. This information about this product is preliminary. The product is under development and not commercially available in the U.S., and its future availability cannot be ensured.