THE ADDED VALUE OF THREE DIMENSION DOUBLE INVERSION RECOVERY MAGNETIC RESONANCE SEQUENCE IN DETECTION OF BRAIN LESIONS IN MULTIPLE SCLEROSIS PATIENTS

M.Ihab Reda , Amr Mohamed ElFatatry*, Amal Shawky Ismail, Tasneem Molham Bedair A. lateef
Department of Radio diagnosis, Department of Neuropsychiatry*, Faculty of Medicine, University of Alexandria.

Introduction

Multiple sclerosis (MS) is the most prevalent chronic inflammatory disease of the central nervous system (CNS), affecting more than two million people worldwide and characterized by the presence of multifocal inflammatory demyelinating lesions disseminated in space and in time.

MS lesions may occur in any part of the CNS where myelin exists, but lesions around the ventricles and the corpus callosum are highly suggestive.

High MRI sensitivity in the depiction of plaques in the brain and spinal cord has made this technique the most valuable para-clinical tool for the diagnosis of multiple sclerosis (MS)

Cortical grey matter lesions occur abundantly in MS across all disease courses and are correlated with clinical manifestations, therefore, adding them as diagnostic criteria improves their specificity and reduce misdiagnosis. 2017 revision the panel recommended that, cortical lesions, in addition to sub-cortical lesions can be used to fulfil MRI criteria for DIS.

3D double inversion recovery (3D-DIR) is a new MR sequence, assumed to detect more cortical lesions than conventional sequences, which can be more specific for MS diagnosis and may allow better differentiation from MS mimics.

Aim of the work

The aim of this work to study the added value of three dimensional double inversion recovery MRI sequence in detecting brain lesions in multiple sclerosis.

Subjects and Methods

The study was conducted on thirty patients with definite relapsing- remitting multiple sclerosis according to McDonald criteria and clinical assessment.

All patients were subjected to:

1. Thorough history taking.
2. Clinical and neurological examination.
3. Conventional MRI including the following sequences:

- T1 axial and sagittal sequences. -T2 axial and coronal sequences.
- Axial and sagittal FLAIR sequences.

4- 3D DIR sequence.

5- Statistical analysis of the data.

Results

Table 1: Analysis of the total lesion load measurement in the examined (30) patients.

Total	T2	FLAIR	3D DIR
N	718	731	916
Min. – Max.	4.0 – 71.0	6.0 – 57.0	9.0 – 81.0
Mean ± SD.	23.93 ± 15.42	24.37 ± 13.15	30.53 ± 17.19
Median (IQR)	19.0 (13.0–33.0)	22.0 (14.0–34.0)	30.0 (18.0–37.0)
P	0.0012*	0.007*	

Table 2: Analysis of the lesion load measurement according to intra-cortical region in the examined (30) patients.

Intra-Cortical(C)	T2	FLAIR	3D DIR
N	3	7	49
Min. – Max.	0.0 – 2.0	0.0 – 3.0	0.0 – 8.0
Mean ± SD.	0.10 ± 0.40	0.23 ± 0.68	1.63 ± 2.46
Median (IQR)	0.0 (0.0–0.0)	0.0 (0.0–0.0)	1.0 (0.0–2.0)
P	0.0019*	0.008*	

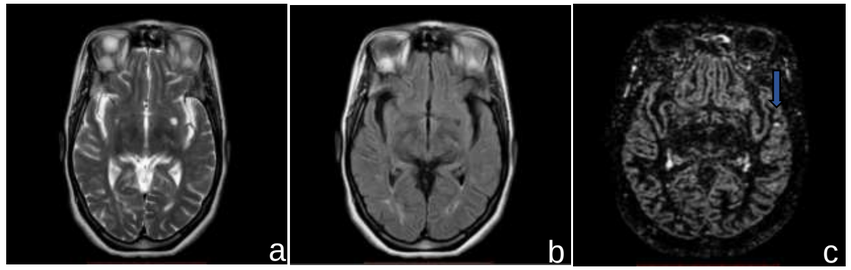

Figure1: Small demylinating cortical lesion seen at left temporal region clearly identified on 3D DIR (c) (blue arrows) and couldn't be visualized on both T2WI (a) and FLAIR (b).

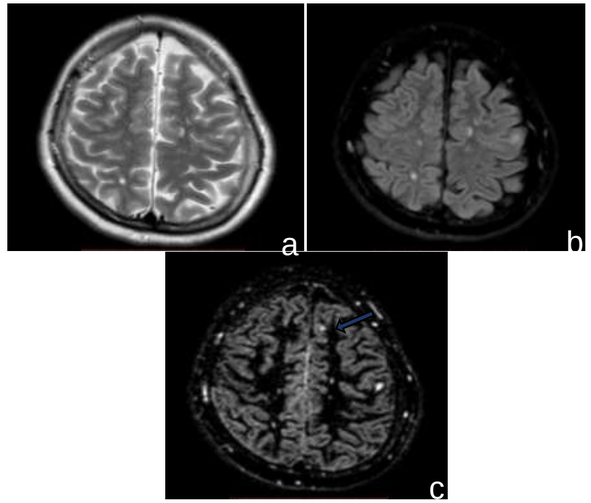

Figure 2: axial planes on T2WI (a) , FLAIR (b) and 3D DIR (c).The 3D DIR sequence shows a cortical lesion at left frontal lobe medially (arrow) that was not clearly identified on T2 and FLAIR images.

Conclusion

- 3D-DIR is a valuable MRI sequence in imaging of multiple sclerosis patients and able to detect more MS lesions compared to T2WI and FLAIR sequences in most of the anatomic locations.
- 3D-DIR sequence leads to a higher sensitivity for cortical, subcortical and mixed gray-white matter lesions in MS patients.
- 3D DIR sequence was as sensitive as the conventional sequences combined at detecting white matter lesions. In other words increased rate of intra-cortical lesion detection with 3D DIR MR Imaging does not come at the cost of decreases in the numbers of white matter lesions counted.