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Evaluating Magnetic Resonance Imaging Sequences for the Detection of Multiple Sclerosis Lesions

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Introduction: Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system (CNS), where early diagnosis is crucial for effective treatment. Magnetic resonance imaging (MRI) plays a key role in detecting inflammatory changes, and the use of advanced sequences such as Double Inversion Recovery (DIR), Short Tau Inversion Recovery (STIR), and Fluid-Attenuated Inversion Recovery (FLAIR) can enhance lesion detection, particularly in infratentorial and subcortical regions. **Methods:** This retrospective cross-sectional study evaluated the diagnostic performance of these sequences in 51 patients with relapsing-remitting MS (RRMS) at Ghazi Hariri Specialized Surgery Hospital, Iraq, between January and December 2019. Patients underwent MRI scans using axial DIR, STIR, and FLAIR sequences with 2 mm slice thickness. Signal intensities of MS lesions were measured and compared across sequences. Statistical analysis, including one-way ANOVA and Chi-square tests, were performed using SPSS version 20 to assess lesion load, sensitivity, specificity, and gender-based lesion prevalence. **Results:** Results revealed that DIR demonstrated significantly higher contrast ratios than both FLAIR and STIR ($p < 0.05$). DIR showed superior sensitivity and specificity in detecting infratentorial lesions (88% and 50%) and subcortical lesions (95% and 67%), respectively. Gender analysis indicated a higher prevalence of lesions in females, with DIR detecting the most pronounced differences. The findings underscore the diagnostic advantage of DIR over conventional sequences, particularly in regions often missed by standard protocols. **Conclusions:** In conclusion, the DIR sequence offers enhanced sensitivity for MS lesion detection and should be incorporated routinely in MRI protocols to improve diagnostic accuracy in MS, especially for infratentorial and subcortical plaques.

Keywords: multiple sclerosis, Double Inversion Recovery, magnetic resonance imaging, infratentorial and subcortical plaques.