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Editorial Letter

Highlighting DIR Brain MRI and Differentiating Between 2D and 3D Acquisition Techniques in the Diagnosis of Multiple Sclerosis

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Dear Editor-in-Chief,

I have read with great interest the article by Mohamed *et al*., titled *"Detection of Multiple Sclerosis Lesions in Supra- and Infra-Tentorial Anatomical Regions by Double Inversion Recovery, FLAIR, and T2 MRI Sequences: A Comparative Study in Iraqi Patients"* (Al-Rafidain J Med Sci. 2023;5(Suppl 1):S172–176.) [1], and I would like to express my sincere appreciation to the authors for their valuable contribution to the growing body of literature on neuroimaging in multiple sclerosis (MS). Their comparative analysis of conventional and advanced MRI pulse sequences provides timely and clinically relevant insights, particularly about the utility of double inversion recovery (DIR) imaging in identifying MS lesions in both supratentorial and infratentorial regions. Multiple sclerosis, being one of the most prevalent demyelinating neurological disorders in young adults, necessitates highly sensitive diagnostic tools for accurate detection and monitoring. Among these tools, brain MRI plays a pivotal role and is central to the McDonald criteria for MS diagnosis [2]. The authors present a detailed and focused comparison of three frequently used MRI sequences—T2-weighted, FLAIR, and double inversion recovery (DIR)—in detecting MS-related lesions. The study method, which involves quantitative lesion counting, provides a direct and objective evaluation that bolsters the credibility of the results. Notably, the DIR sequence is highlighted for its distinctive ability to suppress both cerebrospinal fluid and white matter signals, significantly boosting contrast resolution and enhancing the visibility of gray matter lesions often overlooked by standard imaging techniques. These results are consistent with existing literature that highlights the diagnostic utility of DIR imaging in identifying cortical and juxtacortical lesions [3-5]. It is important to note that the current study employed a 2D DIR sequence, as shown by the use of 3 mm slice thickness and anisotropic voxel dimensions. Although this method is well-recognized and efficient, clearly stating this in the methodology section would improve transparency for readers. Additionally, discussing the potential advantages of 3D DIR, which provides isotropic resolution and multiplanar reformatting capabilities, could further augment the manuscript. Studies such as that by Abdelrahman AS et al. have demonstrated the superior lesion detection capacity of 3D DIR, particularly in cortical and subcortical regions [6], and suggest a promising direction for future comparative investigations. The authors should also be commended for their focused attention on the infratentorial region, a critical anatomical area in MS that is frequently underdiagnosed using standard sequences. The study clearly shows that DIR finds a lot more infratentorial lesions ($p < 0.001$) than T2 and FLAIR. This supports the new diagnostic criteria put in place by McDonald in 2017 that stress how important it is for lesions to be spread out in both time and space. Additionally, the statistical analysis in this study reflects a high standard of rigor. The authors' use of the Bonferroni correction in handling multiple comparisons is an important methodological strength that minimizes type I error and reinforces the credibility of their results. That said, there remain a few areas where this valuable work could be further strengthened. While the authors acknowledge the small sample size ($n = 37$), they do not go into great detail about its effects on statistical power and generalizability. Moreover, the exclusion of patients in remission due to a lack of detectable MRI lesions—especially when using a 1.5 Tesla MRI scanner, which may have reduced sensitivity for subtle cortical or posterior fossa lesions—could have impacted the results by underestimating subclinical disease activity. As lesion detection at 1.5T may miss smaller or more diffuse lesions detectable at higher field strengths, this methodological decision might narrow the scope of findings toward patients with overt radiologic activity. Including these patients in future longitudinal studies, possibly with higher-resolution 3D DIR or black-blood sequences at 3T

or higher field strength, could help find lesions that aren't being seen or that have been there for a long time. This would give a more complete picture of the burden of MS. Another point worth noting is the absence of inter-observer agreement metrics. Since lesion detection—particularly on DIR images—can be affected by artifact-related interpretation variability, it would be beneficial to report measures such as Cohen's kappa to quantify the reliability of lesion counts between the two radiologists. Furthermore, incorporating clinical correlation through disability scales, such as the Expanded Disability Status Scale (EDSS), would have provided valuable insight into the relationship between radiological findings and patient functional outcomes. In conclusion, Mohamed et al. have made a noteworthy contribution to the understanding of MRI's role in multiple sclerosis diagnosis, particularly by highlighting the value of the DIR sequence. The data presented here not only reinforce international findings but also offer valuable insights specific to the Iraqi patient population. By addressing the noted limitations—namely, sample size, artifact differentiation, scanner strength, the exclusion of remission-phase patients, and the integration of clinical parameters—future research can build upon this work to further refine diagnostic strategies. Integrating DIR into routine MRI protocols, especially with advancements such as 3D acquisition and higher-field imaging, may ultimately enhance the early detection of MS, guide therapeutic decisions more effectively, and improve patient outcomes, particularly in those presenting with clinically isolated syndromes or subtle infratentorial involvement.

***Keywords*:** 2 DIR Brain MRI, 3DIR Brain MRI, Multiple sclerosis

Conflict of interests

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