NOVEL MAGNETIC RESONANCE IMAGING CRITERIA IN NECK IMAGING REPORTING AND DATA SYSTEM (NI-RADS)

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Introduction

Head and neck cancer (HNC) is considered the seventh most common malignancy worldwide. Recurrence of HNC poses a significant challenge to long-term survival, with a loco-regional recurrence rate of 30-50% within the first two years of management. Detecting recurrence in HNC through imaging techniques is challenging due to the complexities caused by surgery, radiation, and chemotherapy.

To address these challenges, NI-RADS was developed as a standardized reporting template with management recommendations. NI-RADS categorizes imaging findings and provides management recommendations to differentiate between post-management changes and residual or recurrent tumour. Initially, NI-RADS was applied to CECT and PET-CT and could be used similarly to CE-MRI. Subsequently, in 2021 an independent addition was made for MRI NI-RADS with inclusion of T2 signal intensity (T2SI) at the primary tumour site.

T2SI in MRI can help differentiate fibrotic tissue from edema and granulation tissue, providing varying levels of suspicion. DWI, a functional MRI sequence, detects microscopic changes by measuring the diffusion of water molecules in tissues and assessing tissue cellularity.

Aim of the Work

The aim of this study was to evaluate the role of diffusion-weighted magnetic resonance imaging and T2 signal intensity as NI-RADS criteria.

Subjects and Methods

This study involved 32 patients with a history of managed HNC who underwent MR imaging. The patients had completed their treatment and were examined 3-6 months later. Lymphoma patients, those with non-removable metallic prostheses, incomplete treatment, and NI-RADS 4 patients were excluded. Final diagnosis was confirmed through histopathological assessment, or imaging follow-up.

MR images were obtained using 3T and 1.5T MR systems, including T1- and T2-weighted imaging followed by DWI.

The primary tumour site was assessed in 31 patients based on morphological criteria and T2WI and abnormalities were classified according to the current NI-RADS. Lymph nodes (LNs) were evaluated in all 32 patients for the suspicious features in residual LNs, development of new pathological LNs and the presence of diffusion restriction.

Two reporting templates were used to evaluate the primary site and LNs, one based on current NI-RADS scoring and the other incorporating DWI (modified NI-RADS). In the modified template, diffusion restriction influenced the NI-RADS category grade, with its presence leading to an upgrade and its absence resulting in a downgrade.

Statistical analysis was performed using SPSS software, employing tests such as chi-square, Monte Carlo correction, and Mann-Whitney.

Results

Table 1: Agreement (sensitivity, specificity and accuracy) for different scores in primary tumour site (n = 31)

Primary tumour site	Result		Sensitivity	Specificity	PPV	NPV	Accuracy
	Negative (n = 9)	Positive (n = 22)					
Actual NIRADS							
1 + 2	9	7	68.18	100.0	100.0	56.25	77.42
3	0	15					
Suggested NIRADS							
1 + 2	8	1	95.45	88.89	95.45	88.89	93.55
3	1	21					

Table 2: Agreement (sensitivity, specificity and accuracy) for different scores of LN (n = 32)

Lymph nodes	Result		Sensitivity	Specificity	PPV	NPV	Accuracy
	Negative (n = 24)	Positive (n = 8)					
Actual NIRADS							
1 + 2	24	2	70.0	100.0	100.0	92.31	93.75
3	0	6					
Suggested NIRADS							
1 + 2	23	1	87.5	95.83	87.50	95.83	93.75
3	1	7					

Conclusion

- The application of NI-RADS template at the reporting of post-management MR imaging of HNC aids significantly in differentiation between tumour recurrence and post-management changes.
- DWI including its qualitative and quantitative assessment plays an important role in differentiating post management changes and tumour recurrence in primary tumour site and to lesser extent in the LNs.