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Diagnostic accuracy of [^{99m}Tc]-Tc-HYNIC-PSMA-11 SPECT/CT in differentiating tumor recurrence from post-treatment changes in glioblastoma

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Abstract

Objective: This study aimed to evaluate the diagnostic accuracy of [^{99m}Tc]-Tc-HYNIC-PSMA-11 SPECT/CT in differentiating glioblastoma recurrence from post-treatment changes, comparing both visual and quantitative parameters with follow-up MRI as the reference standard.

Methods: In this cross-sectional study, 31 lesions with suspected glioblastoma recurrence underwent [^{99m}Tc]-Tc-HYNIC-PSMA-11 SPECT/CT imaging. PSMA uptake was assessed visually (0: no uptake, 1: mild, 2: moderate, 3: severe) and quantitatively using the tumor-to-background ratio (TBR). Diagnostic performance was evaluated through ROC analysis, sensitivity, specificity, and area under the curve (AUC) comparisons.

Results: Among the 30 patients with 31 lesions (70% male, mean age 46 years), initial MRI identified recurrence in 38.71% (n = 12), no recurrence in 35.48% (n = 11), and was indeterminate in 25.81% (n = 8) of lesions. Follow-up MRI and other clinical data confirmed recurrence in 58.06% (n = 18) and no recurrence in 41.94% (n = 13). Quantitative SPECT/CT analysis revealed a mean TBR of 13.08 ± 12.09. Visual PSMA assessment demonstrated a sensitivity of 83% and specificity of 92% when considering moderate/high uptake as positive. TBR quantitative analysis showed excellent discrimination (AUC = 0.87), with an optimal threshold of 7.55 yielding 89% sensitivity and 91% specificity. Initial MRI had 100% sensitivity and 91.67% specificity when excluding indeterminate cases. For the 8 patients with indeterminate initial MRI, both visual and quantitative PSMA parameters showed 100% accuracy in predicting the final diagnosis.

Conclusion: [^{99m}Tc]-Tc-HYNIC-PSMA-11 SPECT/CT, particularly using quantitative TBR analysis, offers a reliable alternative to MRI for detecting GBM recurrence, especially in cases where MRI findings are equivocal.

Keywords: Diagnostic accuracy; Glioblastoma; MRI; PSMA SPECT/CT; Recurrence.

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