ABSTRACT

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Distinguishing Progression from Pseudoprogression in Glioblastoma Using (18)F-Fluciclovine PET.

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Rationale: Accurate differentiation between tumor progression (TP) and pseudoprogression remains a critical unmet need in neuro-oncology. 18F-fluciclovine is a widely available synthetic amino acid PET radiotracer. In this study, we aimed to assess the value of 18F-fluciclovine PET for differentiating pseudoprogression from TP in a prospective cohort of patients with suspected radiographic recurrence of glioblastoma.

Methods: We enrolled 30 glioblastoma patients with radiographic progression after first-line chemoradiotherapy who were planned for surgical resection. Patients underwent pre-operative 18F-fluciclovine PET and MRI. Relative percentages of viable tumor and therapy-related changes observed in histopathology were quantified and categorized as TP (≥50% viable tumor), mixed TP (<50% and >10% viable tumor), or pseudoprogression (≤10% viable tumor).

Results: Eighteen patients had TP, 4 mixed TP, and 8 pseudoprogression. Patients with TP/mixed TP had significantly higher 40-50 minutes SUVmax (6.64+ 1.88 vs 4.11± 1.52, P = 0.009) compared to patients with pseudoprogression. A 40-50 minutes SUVmax cut-off of 4.66 provided 90% sensitivity and 83% specificity for differentiation of TP/mixed TP from pseudoprogression (Area under the curve (AUC)=0.86). Relative cerebral blood volume (rCBVmax) cut-off 3.672 provided 90% sensitivity and 71% specificity for differentiation of TP/mixed TP from Pseudoprogression (AUC=0.779). Combining a 40-50 minutes SUVmax cut-off of 4.66 and a rCBVmax cut-off of 3.67 on MRI provided 100% sensitivity and 80% specificity for differentiating TP/mixed TP from Pseudoprogression (AUC=0.95).

Conclusion: 18F-fluciclovine PET uptake can accurately differentiate pseudoprogression from TP in glioblastoma, with even greater accuracy when combined with multi-parametric MRI. Given the wide availability of 18F-fluciclovine, larger, multicenter studies are warranted to determine whether amino acid PET with 18F-fluciclovine should be used in the routine assessment of post-treatment glioblastoma.

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