Texture indices of 4'-[methyl-^{11}C]-thiothymidine uptake predict p16 status in patients with newly diagnosed oropharyngeal squamous cell carcinoma: comparison with ^{18}F-FDG uptake

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Abstract

Background: In oropharyngeal squamous cell carcinoma (OPSCC), human papillomavirus (HPV)/p16 status is important as a prognostic biomarker.

Purpose: We evaluated the relationship between 4'-[methyl-^{11}C]-thiothymidine (^{11}C-4DST) and ^{18}F-FDG PET texture indices and p16 status in patients with newly diagnosed OPSCC.

Methods: We retrospectively reviewed the collected data of 256 consecutive, previously untreated patients with primary head and neck tumors enrolled between November 2011 and October 2019. Complete data on both ^{11}C-4DST and ^{18}F-FDG PET/CT studies before therapy, patients with OPSCC, and p16 status were available for 34 patients. Six of them were excluded because they did not exhibit sufficient ^{11}C-4DST and/or ^{18}F-FDG tumor uptake to perform textural analysis. Finally, 28 patients with newly diagnosed OPSCC were investigated. The

maximum standardized uptake value (SUVmax) and 6 texture indices (homogeneity, entropy, short-run emphasis, long-run emphasis, low gray-level zone emphasis, and high gray-level zone emphasis) were derived from PET images. The presence of p16 expression in tumor specimens was examined by immunohistochemistry and compared with the PET parameters.

Results: Using ^{11}C-4DST, the expression of p16 was associated with a higher homogeneity ($P = 0.012$), lower short-run emphasis ($P = 0.005$), higher long-run emphasis ($P = 0.009$), and lower high-gray-level-zone emphasis ($P = 0.042$) values. There was no significant difference between ^{18}F-FDG PET parameters and p16 status.

Conclusion: Texture indices of the primary tumor on ^{11}C-4DST PET, but not ^{18}F-FDG PET, may be of value in predicting the condition's p16 status in patients with newly diagnosed OPSCC.

Keywords: ^{11}C-4DST, ^{18}F-FDG, PET, Oropharyngeal squamous cell carcinoma, Texture