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QUALITATIVE AND SEMIQUANTITATIVE ASSESSMENT OF INTRALESIONAL UPTAKE MISMATCH BETWEEN FDG AND PSMA PET/CT IN NEOPLASTIC LESIONS

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Positron emission tomography/computed tomography (PET/CT) with [18F]FDG is widely used to assess tumor glycolytic metabolism, whereas [18F]PSMA-1007 or [68Ga]PSMA-11 PET/CT is associated with tumor neovascularization. Notably, some lesions exhibit an intralesional "mismatch", in which different regions within the same lesion demonstrate higher uptake of either [18F]FDG or PSMA-targeted radiotracers, suggesting distinct metabolic phenotypes and possible intratumoral heterogeneity. However, few studies have explored the combined use of these tracers. To evaluate the intralesional distribution of [18F]FDG and ([18F]PSMA-1007 or [68Ga]PSMA-11) in PET/CT images across malignancies using qualitative and semiquantitative parameters, aiming to investigate patterns of intralesional uptake mismatch. This retrospective cross-sectional study included patients with differentiated thyroid cancer, lung cancer, hepatocellular carcinoma, lymphoma, and multiple myeloma undergoing staging or restaging. All patients underwent both [18F]FDG and [18F]PSMA-1007 or [68Ga]PSMA-11 PET/CT within an interval. The largest soft-tissue lesion (or bone lesion with a soft-tissue component) with a maximum diameter = 4 cm was selected for analysis. PET/CT images were evaluated qualitatively and semiquantitatively. Qualitative assessment of intralesional tracer uptake differences was performed using a classification system. Intralesional PSMA distribution relative to FDG uptake was classified as peripheral (1), central (2), diffuse (3), or segmental (4). Semiquantitative parameters, including SUVmax, SUVmean, metabolic tumor volume (MTV), and total lesion metabolism (TLM; MTV × SUVmean), were measured with a PET/CT viewer plug-in for ImageJ (FIJI). MTV was defined using a fixed SUV threshold (= 2.5) for [18F]FDG and uptake above the mediastinal blood pool for PSMA tracers.Eleven patients were included: 3/11 (27%) thyroid cancer, 3/11 (27%) lung cancer, 2/11 (18%) hepatocellular carcinoma, 2/11 (18%) multiple myeloma, and 1/11 (9%) lymphoma (3 males, 8 females; mean age 63.4 ± 13.8 years). Visual analysis demonstrated predominantly peripheral PSMA uptake in 5/11 patients (46%), including all thyroid cancer cases. Segmental PSMA uptake was observed in 3/11 (27%), central uptake in 2/11 (18%), and diffuse uptake in 1/11 (9%). Median (range) SUVmax, SUVmean, MTV, and TLM for PSMA and FDG were respectively: 21.5 (4.9–73) vs 14.8 (4.1–36.6) [p = 0.4389]; 6.22 (2.93–12.5) vs 7 (3–17.6); [p = 0.9314]; 81.7 (3.3–228.9) vs. 77.2 (14.9–313.5) [p = 0.6665]; and 519.5 (9.7–1345.3) vs 716.2 (46.8–4229.2) [p = 0.5457].Intralesional uptake mismatch between FDG and PSMA is highly prevalent across neoplastic lesions from different malignancies. However, semiquantitative parameters did not differ significantly at the population level, possibly due to the limited sample size or because this phenomenon is predominantly spatial and not fully captured by global metrics. The frequent peripheral PSMA uptake pattern may reflect neovascularization surrounding relatively hypoxic or necrotic tumor cores. Segmental and central uptake patterns may suggest the coexistence of distinct tumor cell clones within the same lesion, whereas diffuse uptake may reflect more homogeneous tumor biology. Further studies integrating PET imaging with spatially correlated, multi-site tumor biopsies are warranted to clarify the biological significance of intralesional FDG/PSMA mismatch patterns across different cancers.

Keywords: FDG PET/CT, PSMA PET/CT, Intralesional mismatch, Tumor heterogeneity.

Conflicts of interest: Not declared.

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ASSESSMENT OF THE METABOLIC PROFILE IN GASTRIC CANCER ASSOCIATED CACHEXIA

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Introduction: Cancer-associated cachexia is a complex syndrome defined by the progressive loss of fat and skeletal muscle, resistant to conventionally used nutritional interventions. Recent