



Potential use of [¹⁸F]FDG heterogeneity in discrimination of two different synchronous primary tumors

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Nuclear medicine techniques include positron emission tomography/computed tomography (PET/CT) or single photon emission tomography (SPECT) which allow a non-invasive way to measure specific processes based on the radiotracer accumulation. Over 80% of PET/CT studies are performed in oncology and this modality is better than conventional imaging modalities like magnetic resonance imaging (MRI) or computed tomography (CT), because it allows the severity of the disease to be assessed by one examination [1]. It was shown that [¹⁸F]FDG PET/CT is helpful in detection of primary tumor including head and neck cancer patients [2].

An 71-year-old female with diagnosed planoepitheliale cancer of the nasal cavity underwent a standard [¹⁸F]FDG PET/CT examination (1h post injection of 348MBq) and delayed one (2h post injection) because of suspected dissemination of the disease. Examination was performed on a Gemini TOF PET/CT scanner with area from the vertex to the mid-tight according to the standard EANM protocols [3]. Metabolic parameter: maximum standardized uptake value (SUV_{max}), as well as heterogeneity parameters: kurtosis and skewness were extracted and evaluated in both (standard and delayed images) on the dedicated workstation.

The scan revealed a focal uptake into a nasal cavity with SUV_{max} up to 10.11 (a) increased uptake on the right temporal site of the skin with SUV_{max} up to 3.96 (b) and a hypermetabolic mass in the upper right lobe of the lung with SUV_{max} up to 11.27 (c). Delayed [¹⁸F]FDG PET/CT study which showed an increase of the activity in the nasal cavity (SUV_{max} up to 13.87), on the right temporal site of the skin (SUV_{max} up to 4.78) and in the right upper lobe of the lung (SUV_{max} up to 17.36). After histopathological examination of the mass in the right lobe anaplastic carcinoma: CK(AE1/AE3)+, TTF1+, SYN+, Ki67 > 90% was confirmed. Standard and delayed [¹⁸F]FDG PET/CT examination showed that the increase of [¹⁸F]FDG uptake in planoepitheliale cancer was 37%, while in anaplastic lung cancer it was 54%. Almost 50% difference was noted between planoepitheliale cancer and anaplastic lung cancer in kurtosis (–0.51 vs. –0.96 and –0.47 vs. –0.81) in standard and delayed images, respectively. Slight differences were shown in skewness (0.11 vs. –0.18 and 0.09 vs. –0.06) in standard and delayed images, respectively.

[¹⁸F]FDG PET/CT examination is a commonly used tool for staging, assessing therapy response, recurrence and prognosis in cancer patients [4].

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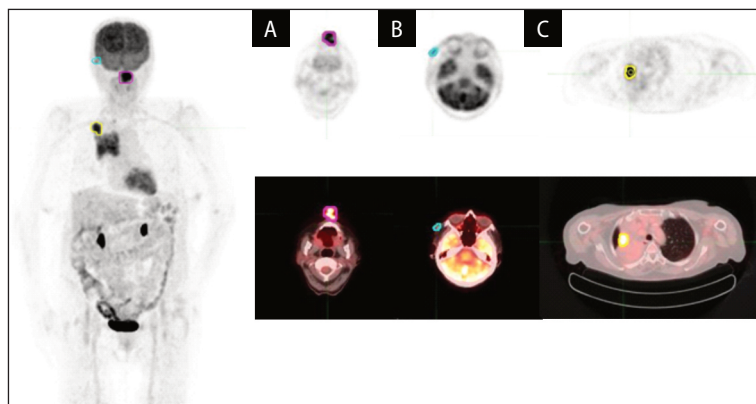


Figure 1. **A.** Focal uptake into a nasal cavity with SUV_{max} up to 10.11; **B.** Increased uptake on the right temporal site of the skin with SUV_{max} up to 3.96; **C.** A hypermetabolic mass in the upper right lobe of the lung with SUV_{max} up to 11.27

Histopathological type of the cancer have been shown to have an impact on several [¹⁸F]FDG PET-derived parameters [5]. It has been reported that dual and multiple time point [¹⁸F]FDG PET imaging provides useful diagnostic and prognostic information [6]. That was also confirmed in our examination: both primary tumor values increased in delayed imaging; moreover, they differed depending on histopathology (SUV_{max} of 13.87 for planoepitheliale compared to 17.36 for anaplastic carcinoma) in delayed images. Moreover, some authors suggest that heterogeneity parameters provide incremental value over SUV_{max} in predicting response in some types of cancer [7]. Some studies also suggest that heterogeneity measured on initial [¹⁸F]FDG PET/CT provides information about outcome in oncological patients, including lung and head and neck cancer [7]. Even though we did not assess the outcome of this patient, we noticed almost 50% difference in terms of kurtosis parameter between the two distinct histopathological types of primary tumor. This indicates that not the only commonly known SUV_{max}, but, more importantly, also heterogeneity parameters obtained from [¹⁸F]FDG PET studies might serve as the first line differentiation (histopathological examination is still a gold standard) of different histopathology.

Performing standard and delayed examination with additional analysis of lesion kurtosis provides additional value in the discrimination of different histopathological primaries.

Conflict of interest

None declared.

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None declared

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