

Editorial

The Problem of Metabolic Tumor Volume in FDG/PET for Evaluating Cancers - Determination of Threshold and Use of Methionine-PET

Shigeki Nagamachi*

Department of Radiology, Miyazaki University, Japan

EDITORIAL

The clinical use of [¹⁸F] Fluoro-Deoxy-Glucose Positron Emission Tomography (FDG-PET) has emerged as a non-invasive diagnostic tool for malignant tumors and become widespread [1]. Although the most frequently used index is the maximum standardized uptake value (SUVmax) [2,3], it cannot reflect metabolic activity of the tumor whole volume. [4]. Recently, volume-based parameters such as Metabolic Tumor Volume (MTV) or total lesion glycolysis (TLG) have come to be used as important prognostic markers in several cancers [5-8]. MTV is defined as the volume of hyper-metabolic tissue within the region of the gross tumor with an SUV greater than certain threshold. Total Lesion Glycolysis (TLG) is calculated by multiplying the mean standardized uptake value (SUVmean) by the tumor volume [9]. Although appropriate threshold value is still under discussion, MTV at threshold about 40% is significant predictor of patients' outcome in head and neck cancer (HNC) [10,11]. However, it will not cover entire tumor volume even if we set it in 40% threshold (Figure 1). In non-small cell lung cancer (NSCLC), various thresholds such as 50% or 70% were used for calculating MTV [12,13]. In our data, the most appropriate threshold in calculating MTV for early prediction of therapeutic effect of NSCLC was fixed value SUV2.5 or SUV3.5. (Figure 2). The agreement of an appropriate threshold is necessary for evaluating prognostic values of cancer treatment.

In brain tumor, measuring MTV by FDG is difficult owing to physiological uptake of normal brain tissues. For the accurate demarcation of tumor FDG uptake, PET/MRI fusion image will be useful technique [14,15] (Figure 3). In contrast, tumor uptake is clearly delineated because of weak physiological uptake of brain by methionine PET. [16,17]. In our pilot data of 13 Glioblastoma (GBM), MTV is significantly higher in methionine-PET compared with that of FDG-PET (33.1ml vs. 19.3ml). Although many previous reports have addressed the differences between the two radiopharmaceuticals [16,17], we first confirmed volumetrically them based on the difference of metabolism substrate. Such

Corresponding author

Shigeki Nagamachi, Department of Radiology, Miyazaki University, Miyazaki prefecture, 889-1692, Japan, Email: snagama@med.miyazaki-u.ac.jp

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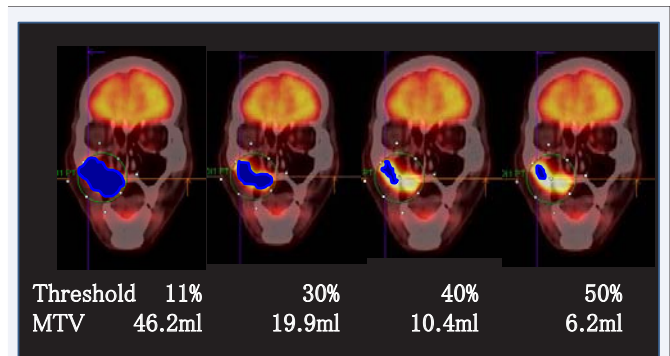


Figure 1 MTV of various cut-off values in head-neck cancer. The whole tumor metabolic volume is accurately calculated in the threshold of 11%. In the threshold of 40%, MTV is quarter of the 11% threshold volume.

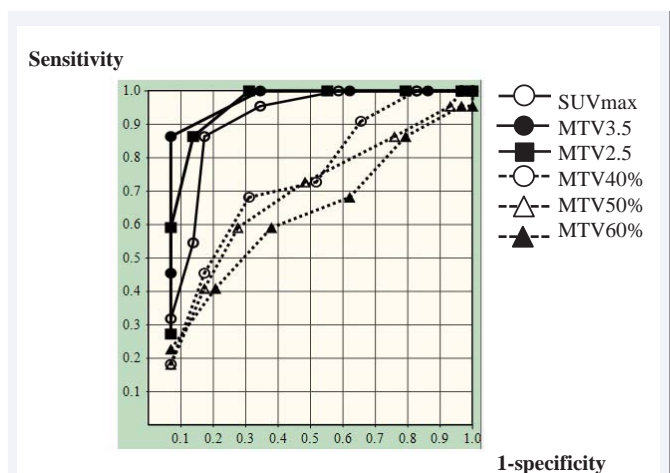
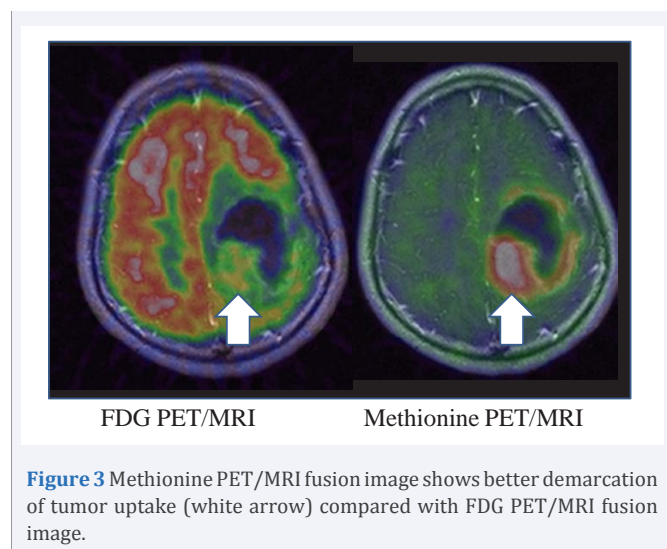


Figure 2 Predictive values for early therapeutic effect by various threshold of MTV in NSCLC - comparison by ROC analysis-. MTV by threshold of SUVmax 2.5 and SUVmax 3.5 showed significantly higher predictive abilities compared with MTV by threshold 40% or 50%.



difference in tumor metabolism substrate is thought to be important in determining cancer therapeutic strategy [18]. However, there are few reports of methionine-PET addressing volume based parameters [19]. In future, individual cancer metabolism assessed by volume based parameter will play an important role in cancer therapy [19].

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